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VOL. VI.

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ORIGINAL COMMUNICATIONS.

"A body of men engaged in the same pursuit, form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.

Calcutta:

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On the Tea Plantations in Kumaon and Gurwahl, and on the method of treating the Tea Plant, the Manufacture of Black and Green Teas, with a short account of Implements used (with figures). By WILLIAM JAMESON, ESQ., *Superintendent Botanical Gardens, North-Western Provinces.*

[Communicated by the Government N. W. P.]

To the Secretary to the Agricultural and Horticultural Society, Calcutta.

Rev. Dept. SIR,—I am desired to forward to you for submission to the Agricultural and Horticultural Society, and for publication in their Transactions, the annexed original report from Dr. Jameson, regarding the cultivation and manufacture of Tea in Kumaon and in Deyrah Dhoon. The document is sent in original in order to avoid the errors to which transcription would probably give rise. The drawings which accompany the report are also forwarded in original; and it is hoped that they too will appear in the Transactions.

2nd. The Lieutenant Governor will feel thankful if he can be furnished with a hundred copies of the article in a detached form, in order that they may be officially circulated in these Provinces. If the drawings should be found to involve more expense than the Society feel themselves warranted to incur, the Lieutenant Governor is prepared to bear a just portion of the charge.

3rd. It seems right to notice with reference to para. 41 of Dr. Jameson's report, that the Right Honorable the Governor General has lately sanctioned the formation of a canal which will leave the Jumna near the village of Kutta Phutthur, and will bring under irrigation the whole of the tract referred to. The scheme for this canal projected by Major T. P. Cautley, Artillery, will be found in Volume xi, of the Journal of the Asiatic Society, No. 128, for August 1842. It is hoped, that this canal will be in a state of forwardness during the approaching cold season.

4th. Measures are in progress for procuring fresh varieties of the seed of the tea plant from China, as recommended in para. 49 of Dr. Jameson's report.

I have, &c.,

HEAD-QUARTERS : J. THORNTON,
The 25th August, 1847. *Secy. to Govt. N. W. P.*

In the report that I am now about to submit for the consideration of the Honorable the Lieutenant Governor, it is my intention to show briefly what has been done since I reported generally in September 1845.* I shall then give an account of the method of treating the tea plants, &c. which may be useful, as suggested by the Honorable the Lieutenant Governor, to those about to enter on tea cultivation, and a guide to the overseers who have lately been appointed to superintend the plantations.

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* For this report, see Journal, Vol. iv. page 173.—EDS.

2. For convenience sake, I shall divide the report as follows:—

PART I.

1st. Progress of the tea plantations.

2nd. Number of young plants fit for transplanting.

3rd. Quantity of tea manufactured, and future prospects.

4th. Sale of tea at Almorah, in July 1847.

PART II.

5th. Soil best adapted for the tea plant.

6th. Altitude above the sea best adapted for the tea plant.

7th. On the method of preparing ground, preparatory to forming plantations, viz:—*fencing, draining, ploughing, trenching, formation of roads or paths.*

8th. On seeds when ripe, and season and method to be adopted to ascertain it.

9th. On the method of sowing seeds, and on the treatment of the young plant after it has germinated.

10th. Method of rearing plantations, viz:—*By sowing seeds, by layers, by cuttings.*

11th. On transplanting and season.

12th. On pruning.

13th. On irrigation.

14th. On the tea plant; season of flowering; its character and species, and on the advantages to be derived by importing seeds from China.

15th. Method and season of plucking and gathering tea leaves.

16th. On the method of manufacturing black tea.

17th. On the method of manufacturing green tea.

18th. On packing tea.

19th. On the mode of preparing sheet lead.

20th. Buildings necessary for manufacturing tea.

21st. Implements required in the manufacture of tea.

22nd. Concluding remarks.

I.—*Progress of the Tea Plantations.*

3. The land under cultivation with tea in Kumaon and Gurwahl, may now be estimated at above 162 acres, thus:—

	Acres.	
KUMAON.		
Russiah,	57	
Bhurtpoor,	4½	
Kooasur, Annoo,	46	
Lutchmisser,	3	
Kuppeena,	4	
Huwalbaugh, Chullar,	30	
		144½
GURWAHL.		
Guddowli,	8	
Kaolagir,	8	
Kouth,*	1	
Rumaserai,	1	
		18
Total,		162½

In addition there are 258,841 seedlings, &c., ready to transplant. It was my intention* last season to have added another plantation to the Almorah district, as it would have been under the immediate superintendence of the overseer stationed at Huwalbaugh, but owing to the difficulty of procuring land adapted to the cultivation of tea in the immediate neighbourhood of the capital of the province, it was not established. There are however plenty of lands available in the neighbourhood of Russiah and Kooasur for further extension.

4. I accompanied Mr. Commissioner Lushington to Bishnuth in September, being informed by him and Mr. Batten,

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* See last report Journal Agricultural and Horticultural Society of Calcutta, Vol. iv. p. 180.

that in its neighbourhood, a large tract of country, well adapted to tea cultivation, was lying waste. Such, however, no doubt, was the case prior to the last settlement: now all the irrigable land is covered with rich cultivation. I must now, therefore, extend the plantations in the Chekhata district.

5. In Gurwahl, this remark of want of land close to the proposed manufactory does not apply; as in the immediate neighbourhood of the plantation of Guddowli there are hundreds of acres lying waste, and covered with dense tree and shrub vegetation, giving cover to bears, leopards, deer, and tigers. Were, however, these extensive jungles cleared, these animals would of course disappear. Here at present there are only three mallees, and therefore much additional assistance is required. By the assistance of prisoners, for whom I was indebted to Captain H. Ramsay, and a few coolies, four to five acres of land have been already cleared, in order to transplant some thousands of young seedling plants which were ready for the purpose.

6. In the Deyrah Dhoon, too, any quantity of land can be obtained, and there are many thousands of young plants available in the Rumaserai and Kouth and other plantations for transplanting.

7. Rumaserai nursery might, with advantage, be reduced, as the object for which that plantation was established has been gained; that is, it has been proved that the tea plants thrive well in that locality; all the smaller plants might, therefore, be removed to Deyrah, and the large ones being valuable, as they are the original plants procured by Dr. Gordon in China, or raised from seeds sent by him to Dr. Wallich in the Calcutta Garden,* might be made over to the zemindars of Rumaserai, and a sum equal to one-half of the present expense for keeping up the plantation, given to them,

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* See Tea papers in Blue Book of House of Commons, for 1839, p. 100

in order to induce them to take care of the plants, and transmit the seeds when ripe. The present monthly expenditure is Rupees 12, or Rupees 144 per annum, viz. Rs. 12 × 12=144. Rumaserai is about 70 miles distant from Mussoorie, in the Tehree Rajah's country, and though the valley is extensive and a great portion of it uncultivated, the plantation could not, probably, be increased without a reference to the Rajah. Nor would the tea leaves be available unless Government were prepared to establish (which would not be advisable at present) a manufactory somewhere in the Rajah's country, as Deyrah is too far distant for them to be transported, over a rugged and mountainous country without detriment.

8. Nor is there any advantage to be gained by keeping up the Kouth plantation, also in the Tehree Rajah's country, further than as a seed depôt. It too therefore, might, with advantage be placed on the same footing as that of Rumaserai. The annual expenditure is the same.

II.—*Number of young Plants ready for transplanting.*

9. In addition to the last year's young plants in the following table—

Table showing the number of Seedling Plants, &c. of 1846 *ready to Transplant.*

Name of Plantation.	No. of seedlings of 1846.	Layers.	Cuttings.
KUMAON.			
Bhurtpoor, ...	6,232	775	..
Lutchmisser, ...	9,544	..	..
Kuppeena, ...	16,014	..	..
Russiah, ...	59,712	..	5,224
Kooasur, ...	91,000	..	..
Annoo, ...	24,000	..	..
Huwalbaugh, ...	36,340	..	..
Chullar, ...	..	..	..
Total, ...	242,842	775	5,224

Name of Plantation.	No. of seedlings of 1846.	Layers.	Cuttings.
GURWAHL.			
Guddowli, ...	5,000	..	..
Kaolagir, ...	4,000	..	..
Kouth, ...	500	..	..
Rumaserai, ...	500	..	..
Total, ...	10,000	..	..
Grand Total, ...	252,842	775	5,224

about a crore of seeds, the produce of the plantations, have been sown, and as two-thirds generally germinate, there ought to be upwards of 600,000 seedlings this season, which will be ready to transplant by the end of the rains, or from September to March.

10. To the kindness of Mr. Lushington and Captain H. Ramsay, I am indebted for a large quantity of seeds, the produce of tea plants in their gardens.

III.—*Quantity of Tea manufactured, and future prospects.*

11. The quantity of tea manufactured as per appended tables—

Table showing the quantity of Tea manufactured in 1845.

Name of Plantation.	Number of acres.	Quantity of black Pouchong Tea.		Quantity of Bohea Tea.		Total.		Quantity[*] of Green Tea.		Grand Total.	
		lb	oz.	lb	oz.	lb	oz.	lb	oz.	lb	oz.
Huwalbaugh, ..	30	24	..	4	12	28	12	..	..	..	..
Lutchmisser, ...	3	166	12	50	..	216	12	..	..	..	..
Kuppeena, ...	4	120	..	16	4	136	4	..	..	..	..
Bhurtpoor, ...	3	63	..	14	6	77	6	..	..	..	..
Russiah, ...	49	124	..	27	..	151	..	..	..	..	..
Grand Total, ..	89	497	12	112	6	610	2	..	..	..	..

[*] The Green Tea implements did not arrive in time to enable the manufacturers to make Green Tea this season.

Table showing the quantity of Tea manufactured in 1846.

Name of Plantation.	Number of acres.	Quantity of black Pou-chong Tea.	Quantity of Bohea Tea.	Total.	Quantity of green Tea.	Grand Total.
		℔ oz.	℔ oz.	℔ oz.	℔ oz.	℔ oz.
Huwalbaugh, ..	30	43 10	9 6	53 ..	10 ..	63 ..
Lutchmisser, ..	3	156 14	36 1	192 15	80 ..	272 15
Kuppeena, ..	4	126 14	37 8	164 6	52 ..	216 6
Bhurtpoor, ..	..	64 14	19 4	84 2	40 ..	124 2
Russiah, ...	49	211 8	61 12	273 4	63 ..	336 4
Kooasur, ...	29	9 12	1 4	11 ..	.. ..	11 ..
Grand Total, ..	115	613 8	165 3	778 11	245 ..	1023 11

amounted in 1845 to 610 ℔ 2oz., and in 1846, or last season, to 1,023 ℔ 11oz. From these tables we find, that the small nursery of Lutchmisser, consisting of three acres of land, gave a return in 1845 of 216 ℔, or 2 maunds and 56 pounds; in 1846 the return was 272 ℔, or 3 maunds and 32 pounds.

12. The small plantation of Kuppeena, established in 1841-42, and then consisting of three acres (but increased in 1844 to four), yielded in 1845 1 maund and 56 pounds, and in 1846 2 maunds and 56 pounds. Thus we have received from a plantation of only five years' formation, and of four acres, one of these recently added, upwards of two and a half maunds of tea, and from another, Lutchmisser, of three acres, which was established in 1835-36, 3 maunds and 30 pounds, equal to 272 ℔. I have in a former report asserted, that the minimum return of tea for an acre of land may be estimated at one pucka maund, or 80 ℔. The only plantations that I can as yet bring forward in favor of my assertion, are the two above-mentioned: Kuppeena has not yielded the proportion mentioned, but as stated,* it was only established in 1841-42, and the tea plants do not come into full bearing

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* See Report Loc. Cit. p. 180.

until the 8th year: on the other hand, Lutchmisser has given more than the average return. I think, therefore, that the returns already yielded are highly favorable, and that though the data are small, they are highly satisfactory.

IV.—*Sale of Tea at Almorah, in July* 1846.

13. At this sale nothing but black (Pouchong) tea was put up, the Bohea tea having been reserved for the natives of Bhote. The maximum price per seer realized was Rupees 7-7; minimum Rupees 4-8, and average Rupees 6-8-8.

14. The large price given, shows the estimation in which it is held in the province, and from the table* appended it will be perceived, that of the 38 boxes sold by public auction, 29 realized upwards of Rupees 7 per seer, and that by the native community 20 boxes were purchased.†

15. *Bohea tea.*—Several boxes of this coarse tea have been sold to the Bhoteahs, at a price varying from Rs. 2 to Rs. 2-4 per seer. It has been purchased by them in order to carry it across the passes into Thibet; details will afterwards be furnished. I may state, that it has been sold at a low rate in order to induce a demand,‡ and to exclude from the British provinces the miserable article which is imported by the Bhoteahs under the name of tea from Chinese Tartary. Nor will it be long, if the importation of Kumaon tea into Chinese Tartary is not prohibited, before that market is wholly supplied from the British provinces.

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[*] See appendix A.

[†] In addition to these 38 boxes, 12 boxes containing 453 ℔ of tea have been dispatched to the Hon'ble the Court of Directors.

[‡] It has been a matter of surprise why tea should be so much sought after by the poorer classes, as by many it is looked on more as a luxury than as of use to the human system. The manner in which it acts, and the cause why it is in so much demand by all classes, is satisfactorily explained by Liebig, and the benefit therefore which will be conferred by selling it at a low rate, and thus placing it within the means of all, will, no doubt, ere long, be duly appreciated. Liebig says, without entering minutely into the

V.—*Soil best adapted for the Tea Plant.*

16. The soil in which the tea plant is now thriving in the Himalayas and in the valley of Deyrah Dhoon, varies exceedingly. At Bhurtpoor and Russiah it is of a light silico-aluminous nature, and abounding with small pieces of clay slate, which is the subjacent rock, and trap (greenstone) which occurs in large dykes cutting through and altering the strata of clay slate, mixed with the stony soil, there is a small quantity of vegetable matter. The clay slate is metamorphic, being almost entirely composed of mica. In some places it is mixed with quartz forming mica slate. From the decomposition of these rocks, mixed with a small quantity of vegetable matter, the soil is formed. At Kup-

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medical action of Coffeine (Theine) it will surely appear a most striking fact, even if we were to deny its influence on the process of secretion, that this substance, with the addition of oxygen and the elements of water, can yield Taurine, the nitrogenized compound peculiar to bile :

1. Atom Coffeine or Theine = C. 8. N. 2. H. 5. O. 2.
9. Atoms Water, = „ „ H. 9. O. 9.
9. Atoms Oxygen, = „ „ „ O. 9.

= 2. Atoms Taurine, C. 8. N. 2. H. 14. O. 20.
= 2. C. 4. N. H. 9. O. 10.

To see how the action of Coffeine, Asparagine, Theobromine, &c., may be explained, we must call to mind, that the chief constituent of the bile contains only 3·8 per cent. of nitrogen, of which only the half or 1·9 per cent. belongs to the Taurine. Bile contains, in its natural state, water and solid matter, in the proportion of 90 parts by weight of the former to 10 of the latter. If we suppose these 10 parts by weight of solid matter to be chloric acid, with 3·87 per cent. of nitrogen, then 100 parts of 0·171 of nitrogen in the shape of Taurine. Now this quantity is contained in 0·6 parts of Coffeine, or $2\frac{8}{10}$th grains of Coffeine can give to an ounce of bile the nitrogen it contains in the form of Taurine. If an infusion of tea contain no more than the $\frac{1}{10}$th of a grain of Coffeine, still, if it contribute in point of fact to the formation of bile, the action, even of such a quantity, cannot be looked upon as a nullity. Neither can it be denied, that in the case of an excess of non-azotized food, and a deficiency of motion, which is required to cause the change of matter of the tissues, and thus to yield the nitrogenized product which enters peena and Lutchmisser, the soil is also very stony, formed from the decomposition of clay slate, which, in many places, as at Russiah and Bhurtpoor, passes into mica slate, or alternates with it, and a little vegetable matter. The same remark applies to the plantations of Guddowli, Kouth, and Rumaserai. At Huwalbaugh part of the soil consists of a stiff clay, of a reddish-yellow color, owing to peroxide of iron. Here, too, the tea plants, provided that the ground around them is occasionally opened up, thrive well. In Mr. Lushington's garden at Lobha, in Kumaon, and in Assistant Commissioner Capt. H. Ramsay's garden at Pooree, in Gurwahl, plants are thriving well in a rich, black, vegetable mould. The soil in the Deyrah Dhoon varies exceedingly from clayey and stiff soil to sand and gravelly soil, or light and free. The soil at Kaolagir is a compound of the two, neither clayey, nor free, or light soil, being composed partly of clay and sand, mixed with much vegetable mould, and in some places mixed with much gravel, consisting of limestone, marl, sandstone, clay slate, and quartz rock, or of such rocks as enter into the composition of the surrounding ranges of mountains, viz. the Sewalick range to the south, and the Himalayas, properly so called, to the north. From the above state-

into the composition of the bile ; that in such a condition the health may be benefited by the use of compounds which are capable of supplying the place of the nitrogenized substances produced in the healthy state of the body, and essential to the production of an important element of respiration. In a chronical sense, and it is this alone which the preceding remarks are intended to show, Coffeine or Theine, Asparagine, and Theobromine are in virtue of their composition, better adapted to this purpose than all nitrogenized vegetable principles. The action of these substances in ordinary circumstances is not obvious, but it unquestionably exists. Tea and coffee were originally met with among nations whose diet is chiefly vegetable. These facts, remarks Dr. Royle, show in what way tea proves to the poor a substitute for animal food, and why females and literary persons, who take little exercise, manifest such partiality for it. They also explain, why the attempts, and they have been numerous, to find among other plants a substitute for tea, have invariably failed of success."

ment we find, that the tea plant thrives well both in stiff and free soils, and in many modifications of these. But the soil which seems best adapted to its growth may be styled free soil, as at Russiah, or a mixture of both, as at Kaolagir, in the Deyrah Dhoon.

17. In limestone districts, where the tea has been tried, if the superimposed soil has been thin and untransported, and this proved from the decomposition of the subjacent rock, the plant has generally failed, and this has been particularly the case when the limestone, by plutonic action, has become metamorphic. These districts therefore, in forming plantations, are to be avoided.

18. From the writing of various authors* it appears, that the districts where the tea plant thrives best in China, have a geological structure very similar to that met with in many parts of the Himalayas, being composed of primitive and transition rocks.

VI.—*Altitude above the sea best suited to the Tea Plant.*

19. To state what altitude is best adapted to the growth of the tea plant, and for the production of the best kinds of tea, will require much more observation. At present the tea plant thrives equally well at Kaolagir, in the Deyrah Dhoon; at Russiah, in the Chikata district; at Huwalbaugh; at Kuppeena and Lutchmisser; and at Rumaserai, or at heights ranging from 2,200 feet above the level of the sea to 6,000 feet.

20. Moreover, the tea manufactured from leaves procured from Kaolagir, has been considered by the London brokers equal to that made from leaves procured from Lutchmisser and Kuppeena.†

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* See Royle's Illustrations of Indian Botany, p. 112.

† For the report of the London brokers on the tea manufactured at Huwalbaugh, see my report in the Journal of the Agricultural and Horticultural Society of Calcutta, Vol. ii. p. 331.

VII.—*On the method of preparing ground prior to forming a Plantation, viz.: fencing, draining, ploughing, trenching, &c.*

21. In forming a plantation, the first object of attention, both in the hills and in the Deyrah Dhoon, is a *fence.* In the former, to prevent the depredations of wild animals, such as wild hog, deer, &c. which abound in the hills, and though they do not eat tea leaves, yet hogs, in search of tubers, in the space of a single night will do much damage by uprooting young shrubs. In the latter, to prevent the straying of cattle. The first thing to be done, therefore, is to dig a trench three feet broad and two deep, and to plant a hedge, if in the hills, of black thorn *(Cratægus)* : if in the plains, the different species of *aloe* are best adapted for the purpose. The fence being formed, all trees and shrubs are then to be uprooted: this is very heavy work, both in the hills and

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I append here the report of the London brokers on the tea manufactured at Deyrah from leaves procured from the Kaolagir plantation, which was published in the Government Gazette.

"Report on the tea manufactured in the Deyrah Dhoon, received per "*Minerva* June, 1846.

"*Appearance of the Tea.*—Well made, as well as China tea, and similar "to the blackish, mixed curled Tetsong description.

"*Smell.*—As China Tea, but deficient in fragrance, arising probably from "some defect in the firing.

"*Color of the infusion.*—Bright and good.

"*Taste.*—Rich, good, and strong.

"*Expanded Leaf.*—As the finer tea from China.

"*Aroma.*—As good China tea.

"From this, and examinations of former samples, I am quite satisfied that "the tea shrub in Kumaon is not only identical with the China plant, and as "capable of being made into as fine a description of tea, but also that the "climate and soil in Kumaon is as suited to the favorable growth of the "shrubs as the finest of the China localities.

"*8th June,* 1846. (Signed) Wm. Andrews Hunt."

"The leaf is well made, curled, of the Ankoi Pekoe class, mixed black and "brown, and closely resembles that class of China tea."

plains, from the vast number of shrubs, allowed by natives, from indolence to remove them, to grow everywhere throughout their fields. Roads are then to be marked off.

22. After this has been accomplished, the land is to be drained, if necessary, by open drains—under-drainage, for want of means and the expense, being impracticable—and then ploughed three or four times over. The beds for young tea plants are then to be formed; these ought to be three feet in breadth, alternating with a pathway of two feet in breadth. By arranging beds in this manner, much time and labor is saved in transplanting: in irrigation the water is economized, and in plucking tea leaves a road is given to the gatherer. In transplanting, each plant is allowed 4½ feet; this is at once gained, the beds and pathways being formed by placing in one direction, the plant in the centre of the bed.

23. *Trenching.*—On the beds being marked off, they are to be trenched to a depth of from 2 to 3 feet, in order to destroy all the roots of weeds, which are to be carefully removed.

"The flavor is very strong, and would therefore be serviceable for mixing, "but is "coarse burnt," that all richness of flavor is destroyed."

"38, MINCING LANE : "(Signed) WM. THOMSON and SON."
6th June, 1845."

"The sample of tea marked as manufactured in the Deyrah Dhoon, August "1845, in leaf somewhat resembles the tea imported from China as Ning-"Young, with something of the character both of Oolong and Orange Pe-"koe. In flavor it most resembles the better descriptions of Orange Pekoe, "having, with brisk burnt flavor of that description, more than its usual "strength.

"There is, however, in this sample a slight peculiarity of smell and flavor, "which is rather objectionable, but it probably arises from some accidental "cause to which this sample may have been exposed, either in curing or sub-"sequently."

"We consider it a good useful description of tea."

"(Signed) EWART, MACCOUGHEY & DELAFOSSE, *Brokers*."
"CAPTHAL COURT : 17*th June*, 1846."

The trenching is to be performed by the *fowrah* or Indian spade.

24. In the hills, in many places the *fowrah* cannot be used owing to the number of stones. The work is then to be done by the *koatlah,* a flat-pointed piece of iron, of about 8 inches in length, which is inserted into a wooden handle. It is in form like the pick, and is much used in hill cultivation for weeding and opening up the ground. It is, however, not much to be commended for trenching purposes, as natives, in using it, never penetrate the ground beyond a few inches. For weeding however, it is particularly useful, and to such soil is much better adapted than most other implements.

25. *Formation of Roads and Paths.*—In addition to the pathways of 2 feet in breadth recommended to be formed between each bed, there ought, for general use, to be a 4 feet road carried round the plantation, and one of 10 feet through the centre. This applies to a limited plantation, that is, of from 2 to 4 hundred acres: If on the other hand it was on a more extensive scale, several hackery roads of 10 feet in breadth would be necessary, in order to cart away weeds, &c. or carry manure to seedling beds.

VIII.—*On seeds when ripe, and season and method to be adopted to ascertain it.*

26. In all September and October the tea seeds ripen, and in the more elevated plantations, as at Rumaserai, many do not ripen until November. The seeds are contained in a capsule, and vary in number from 1 to 7; to ascertain that they are ripe, open the capsule although green, and if their color is a nut-brown; as represented at *a,* in Fig. No 2, they are sure to be so. If they are not ripe, they are of a reddish-brown above, mixed with white. If the seeds are allowed to remain a short time on the bushes, after they are ripe, the capsules burst, and they fall out: it is necessary, therefore, to remove them before this takes place.

IX.—*On the method of sowing seeds, and season, and on the treatment of the young Tea Plants after they have germinated.*

27. The ground having been first well trenched and manured, that is, from sixty to seventy maunds of manure given to the acre, the seeds are, when ripe, to be removed from the capsules, and immediately sown to the depth of one inch and very close, in drills, 8 to 10 inches apart from each other. The sooner that they are sown after being removed from the capsules the better, as their germinating properties are apt to be destroyed if they are kept for any length of time. Some germinate in the space of a few weeks, others lie dormant until February and March, and others do not germinate until the rains.

28. The method of sowing seeds in China is thus described, being similar to the native plan of sowing mangoes in this country. "Several seeds are dropped into holes four or five inches deep and three or four feet apart, shortly after they ripen, or in November and December; the plants rise up in a cluster when the rains come on. They are seldom transplanted, but sometimes four to six are put quite close to form a fine bush."* By this method nothing is gained, and the expenditure of seeds great.

29. If the plants germinate in November, which, as already stated, many do, they ought to be covered with a *chupper* made of bamboo and grass.

30. In the hills, everywhere at an elevation of 6 and 7000 feet, the Ringal, a small kind of bamboo, of which there are several species, is found in great abundance, and well adapted for the purpose, and in the Deyrah Dhoon the bamboo occurs in vast quantity; the market of the upper provinces being

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* See article Thea by Dr. Royle, in Penny Cyclopædia, Vol. xxiv, p. 286—also Tropical Agriculturist, by Porter, p. 129.

chiefly supplied from that valley and other forests at the base of the Himalayas. Bamboos are also met with to the height of six and seven thousand feet on the Himalayas in the neighbourhood of Almorah; nearly the whole of the bamboos however have been destroyed this season by the severe snow storm of the 3rd February. During the day, in the cold weather, the *chuppers* ought to be removed, and again replaced at night: again, as the weather becomes hot, it is necessary to protect the young plants from the heat of the sun, that is, in April and May, and until the rains commence: the *chuppers* at this time ought to be put on about 8 A. M. and removed again about 4 P. M.

X.—*Method of rearing Plantations by sowing seeds, by layers, and by cuttings.*

31. In the former chapter we have already discussed the method of raising plants by seeds. We shall now notice the other two modes.

32. *Layers.*—The best season for laying down is when the sap is dormant, or in the cold weather, or when in full action as in the rains. "Laying," as expressed by Dr. Lindley, "is nothing but striking from cuttings, which are still allowed to maintain their connection with the mother plant by means of a portion of their stem."* There are various methods of making layers, but the most simple and efficient is to bend down a branch, and sink it into the earth after having made a slit or notch in the centre of the embedded portion. By so doing the descent of the sap is retarded, and thus the formation of radicles or young roots is promoted; about five or six inches, or more of the branch is to be allowed to remain above ground, and in a position as perpendicular to the point where the plant is notched, as possible. In three or four months these layers are ready to be removed and transplanted; the removal of the layers is to be gradual,

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* Neill's Fruit, Flower, and Kitchen Garden, p. 31.

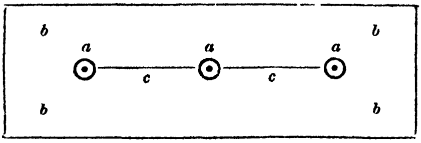
that is, they ought first to be cut half through, then a little more, and finally altogether separated.

33. *Cuttings.*—The best season for propagating by cuttings is the cold weather, that is, from November to February, they may also be propagated, though not with the same success, during the rains: it is necessary to protect them against frost in the cold weather, and from the rays of the sun in the hot. Cuttings put in during the cold weather, are ready to transplant in the rains, and if put in during the rains, they are generally fit for removal in February.

XI.—*On the method of Transplanting and season.*

34. On transplanting young tea plants care is to be taken to lift them with a good large fall of earth attached to their roots, as they throw out a long central or tap root, which, if cut through, invariably destroys the plant. On being placed in the ground, the earth around them is to be well pressed down and watered; the watering is to be continued every third or fourth day, until the plants have taken hold of the ground. During the rains, grass springs up with great rapidity, so as to render it impossible for one man to keep three acres (the quantity assigned by us) clean. This however is not necessary, if care be taken to make a golah round each plant, and keep it clear of weeds; these golahs ought always, in hill plantations, where the ground is irregular, to be connected by small *khauls* or channels, in order to make irrigation easy, by so doing too, water, if the supply be scanty, which often happens in the hills in the hot weather, will be economized.

Thus—



a. Tea plant.
c. Watercourse.
b. Bed.

35. We have already stated that 4½ square feet ought to be assigned to each plant. In China, according to Royle,*

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* Loco citato.

three to four feet are given, this however is too small a space to allow the plant to grow freely. After the tea plants are transplanted, it is not necessary to protect them.

36. The best seasons for transplanting are towards the end of February, or as soon as the frost has ceased, and throughout March, and during the rains, and until the end or middle of November, depending on the season.

37. In transplanting, four parties ought to be employed, viz. one party to dig holes, a second to remove plants, a third to carry them to the ground where they are required, and a fourth to plant. By doing so, not only time is saved, but also the plants have a much better chance, when thus treated, of doing well. When the seedling beds are extensive, so many of the plants ought not to be removed, that is, a plant left every 4½ feet, and these beds added to the plantation.

XII.—*On Pruning, best season and mode.*

38. The plants do not require to be pruned until the fifth year, as the plucking of leaves generally tends to make the plants assume the basket shape, the form most to be desired to procure the greatest quantity of leaves; if, however, the plants show a tendency to run into weed, from central branches being thrown out, this ought to be checked by removing the central stem. In the fourth year a quantity of the old and hard wood ought to be removed, to induce the plant to throw out more branches. The best season for pruning is from November to March.

XIII.—*On Irrigation.*

39. To keep the tea plants healthy, irrigation for two or three years is absolutely necessary, and no unirrigable land ought to be selected for a tea plantation.

40. On the other hand, land liable to be flooded during the rains, and upon which water lies for any length of time, is

equally detrimental to the growth of the plant. This applies to a small portion of the Kooasur plantation, which receives the drainage of the adjoining hills, and the soil being retentive, keeps the water. Deep trenches have been dug in order to drain it off—these, however, owing to the lowness of the surrounding country, act badly. Three successive seasons' plants have been put into the ground, and as often have been destroyed on the setting in of the rains, showing the necessity of avoiding such kind of land for tea plantation.

41. To facilitate irrigation, &c., as already stated, in the Deyrah Dhoon, I have limited the tea beds to three feet in breadth. This is particularly requisite in land so constituted as that of the Deyrah Dhoon, it being so porous, as mentioned by Major Cautley in his notes and memoranda of watercourses:* this is caused by the superincumbent soil not being more than from one to three feet thick, in some places more, but varying exceedingly. Beneath this there is a bed of shingle of vast thickness, through which the water percolates; it is this that renders the sinking of wells so difficult in the Deyrah Dhoon, and which has tended so much to retard individuals from becoming permanent residents. At present there are many tracts of several thousand acres in that valley unoccupied from want of drinking water, as for instance at Innesphaeel.

42. Where the ground is very uneven, as is the case generally in the hills, the *Khaul* system, as already recommended, ought to be adopted.

XIV.—*On the Tea Plant; season of flowering; its characters and species; and on the advantages to be derived from importing seeds from China.*

43. From the importance of tea, as an article of commerce, the plant has attracted much attention, and from few quali-

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* See Notes and Memoranda on the Watercourses in the Deyrah Dhoon.

fied Europeans having travelled in the tea districts of China, there is much difference of opinion as to the number of species belonging to the genus *Thea.*

44. In the Government plantations in Kumaon and Gurwahl, the plants begin to flower about the end of August and beginning of September, or, as the seeds of the former year begin to ripen. They do not all come into flower at once, but some are in full blossom in September, others in October, November, December, or January. Some throw out a second set of blossoms in March, April and May, and during the rains ; so that from the same plant unripe or ripe seeds and flowers may be collected at once and the same time.

45. To the genus *Thea,* which belongs to the order *Ternstrœmiaceæ,* the following characters have been ascribed: calyx persistent, without bracts, 5-leaved, leaflets imbricated, and generally of the same size. Petals of the corolla vary in number from 5 to 9, imbricated, the inner ones much the largest. Stamens numerous, in several rows adhering to the bottom of the petals. Filaments filiform. Anthers incumbent, 2-celled, oblong, with a thickish connectivum. Cells opening longitudinally. Ovary free, 3-celled : ovules 4 in each cell, inserted internally into the central angle, the upper ones ascending, the lower pendulous. Style trifid, stigmas three, acute. Capsule opheroidal, 1-7 lobed, with loculicidal dehiscence, or with dessepiments formed from the turned in edges of the valves. Seeds solitary, or two in cells, shell like testa, marked with the ventral umbilicus. Cotyledons thick, fleshy, oily, no albumen. Radicle very short, very near the umbilicus, centripetal.* In the plantations there are two species, and two well marked varieties.

46. The first is characterized by the leaves being of a pale-green color, thin, almost membranous, broad lanceolate, sinatures or edge irregular and reversed, length from three

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* See Royle, Loco cit., p. 284.

to six inches. The color of the stem of newly formed shoots is of a pale-reddish color, and green towards the end. This species is also marked by its strong growth, its erect stem, and the shoots being generally upright and stiff. The flowers are small, and its seeds but sparing.

In its characters, this plant received from Assam, agrees in part with those assigned by Dr. Lettsom and Sir W. Hooker to the *Thea viridis*,* but differs in its branches being stiff and erect. The flowers small, or rather much about the same size as the species about to be described, and not confined to the upper axils of the plant, and solitary, as stated by them.† In Fig. No. 1. a correct drawing of the plant is given, as it grows in the Kaolagir plantation, in the Deyrah Dhoon. By the Chinese manufacturers it is considered an inferior plant for making tea, it is not therefore grown to any extent.

47. The second species is characterized by its leaves being much smaller, and not so broadly lanceolate; slightly waved, of a *dark-green color*, thick and coriaceous, sinature or edge irregular, length from 1 to 3½ inches. In its growth it is much smaller than the former, and throws out numerous spreading branches, and seldom presents its marked leading stem. This species, therefore, in the above characters, agrees much with those that have been assigned to *Thea Bohea* by authors. The characters have been mixed up in an extraordinary manner. Thus it has been stated, that the *Thea viridis* has large, strong growing and spreading branches, and that *Thea Bohea* is a smaller plant, with branches stiff and straight, and stem erect. No doubt the *Thea viridis* is a much larger and stronger growing plant than the *Thea Bohea*, or rather the plant now existing in the different plantations is so; but in the former the branches are stiff and erect, and in the latter inclined and branching. The marked distinguishing cha-

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* See Royle, Loco cit., p. 285.

† Hooker's Bot. Mag. I. 3148. It is the Assam tea plant.

racters between the two species are the coriaceous dark-green leaves in the *Thea Bohea,* and the large pale-green monhanæous leaves of *Thea viridis.* The manner too of growth is very striking, and on entering the plantation, the distinction is at once most marked to the most unobservant eye. In Fig. 2, a good representation of *Thea Bohea* is given. This species forms nearly the whole of the plantations, and was brought from China by Dr. Gordon.

48. In the plantations there is a third plant, which however, can only be considered a marked variety of *Thea Bohea.* Its leaves are thick, coriaceous, and of a dark-green color, but invariably very small, and not exceeding two inches in length, and thinly lanceolate; the serratures too on the edge, which are straight, are not so deep. In other characters it is identical. This marked variety was received from Calcutta at the plantation in a separate despatch from the others; it is figured in No. 3.

49. But in addition to these there are, no doubt, many more varieties, and though it may be a fact, that in certain districts green tea is manufactured from a species differing from that from which black tea is manufactured; yet in other districts green and black teas are manufactured from one and the same plant. The Chinese manufacturers now in Kumaon state, that the plant is one and the same,* and that it can be proved by converting black tea into green. In manufacturing teas now at the manufactory, if a large quantity of leaves are brought in from the plantations, one-half are converted into green, and one-half into black tea. This only shows that much of the green and black teas of commerce are manufactured from one and the same plant. The Assam plant is, from the characters given, quite a distinct plant, and

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* In a letter lately received from Dr. Royle it is stated, that Mr. Fortune, who lately visited China, maintains that there are two species of *Thea,* viz. *Thea viridis* and *Thea Bohea,* and that from both, green and black teas are manufactured. The *Thea viridis* is the most commonly distributed plant.

agrees as already stated, most nearly with the species described as *Thea viridis.* It would therefore be most desirable to procure seeds of this so-called species, and also of other varieties, of which, no doubt, there is a great variety. From the northern districts of China in particular, seeds ought to be imported, not however, in large quantities, but in quantities of two or three seers, so that they might, on arrival at Calcutta, be sent up the country as quickly as possible, for if the seeds are kept long out of the ground, not one will germinate; such was the fate of all the seeds contained in 10 boxes imported by Government in 1845, not one having germinated, which was much to be regretted. Had they been sent in small parcels, well packed in wax-cloth to prevent them from being injured by moisture, and placed in an airy part of the vessel in transmission from China to Calcutta, and on arrival there, sent by dâwk banghy direct to the plantation, they would, I am confident, have reached in good condition. It is well worthy of a trial; and seeds ought, if possible, to be obtained from every district celebrated for its teas. It is in this manner, by obtaining seeds of the finest varieties of plants, that the finest teas will be procured. I do not mean to infer that the tea plants now under cultivation are not the produce of fine varieties, for that has been proved by the undoubted testimony of the London brokers, but only, that there are no doubt, many others well worthy of introduction. In confirmation of what I have stated, I may quote the words of my late friend Dr. Griffith, who, in his report on the tea plant of Assam, says—"I now come to the consideration of the steps, which in my opinion must be followed if any degree of success in the cultivation of tea is to be expected; of these the most important is the importation of Chinese seeds of unexceptionable quality, and of small numbers of finer sorts."* Dr. Royle too, who was the first person to point out that the Himalayas were well adapted to tea cultivation, and to whom the credit for recommending to Government the introduction of the plant into Northern India is due, strongly urges the necessity of importing seeds from different localities in China, celebrated for their teas.

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* Report on Tea Cultivation submitted to House of Commons. See Blue Book 1839, p. 103.

XV.—*Method and season for plucking and gathering leaves.*

50. The season for picking leaves commences in April and continues until October. The number of gatherings varies, depending on the moisture* or dryness of the season. If the season be good, as many as seven gatherings may be obtained. If, however, the rains are partial, only four or five. These however may be reduced to their general periods for gathering, that from April to June, from July to 15th August, and from September to the end of October. But few leaves are collected after the 15th of the latter month. As soon as the new and young leaves have appeared in April, the first plucking takes place, this being done by the Chinese, assisted by the mallees. The following is the method adopted:—A certain division of the plantation is marked off, and to each man a small basket (fig. 18) is given, with instructions to proceed to a certain point, so that no plant may be passed over. On the small basket being filled, the leaves are emptied into another large one, which is put in some shady place, and in which, when filled, they are conveyed to the manufactory. The leaves are generally plucked with the thumb and forefinger. Sometimes the terminal part of a branch, having four or five young leaves attached, is plucked off. All old leaves are rejected, as they will not curl, and therefore are of no use.

51. As the season advances, and manufactory and plantation works become necessary, the mallees are assisted in gathering

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* In a short time, rain guages will be established at Bheemtal, Huwalbaugh, Paoree, and Kaolagir, in order to measure the quantity of rain that falls annually, for the purpose of ascertaining how much the quantity and quality of the produce of tea is affected by the weather. The tables will be furnished with our reports.

leaves by coolies. The process is simple, and thus every man, woman, and child of villages could be profitably employed, on the plantations being greatly extended. Certain kinds of leaves are not selected in the plantation, in order to make certain kinds of tea, but all new and fresh leaves are indiscriminately collected together, and the different kinds separated on the leaves being fired.

XVI.—*On the method of Manufacturing Black Tea.*

52. The young and fresh leaves on being picked (they only being used, the old ones being too hard, and therefore unfit to curl), are carried to the manufactory, and spread out in a large airy room to cool, and are there kept during the night, being occasionally turned with the hand if brought in in the afternoon; or if brought in during the morning, they are allowed to lie until noon. Early in the morning the manufacturers visit the airing room, and pack up the leaves in baskets, and remove them to the manufacturing room. Each manufacturer takes a basketful, and commences to beat them between the palms of his hands with a lateral motion, in order to soften and make them more pliable for working, and thus prevent them, when rolled, from breaking. This beating process continues for about an hour, and it may either consist of one or two processes, that is, the Chinese sometimes finish the beating process at once; at others, they allow the leaves, after being beat for half an hour, to remain a time and then resume it. They now go to breakfast, and in one hour and a half the leaves are ready for the pan (fig. 3). The pans being heated by wood placed in the oven, (fig. 3 *a.*) so as to feel hot to the hands, are filled to about two-thirds, or about three seers of leaves are thrown in at a time—the quantity which a manufacturer is capable of lifting with both hands. With the hands, the leaves are kept moving with a rotatory motion in the pan, and when they become very hot, the motion is kept up with a pair of forked sticks (fig. 11). This pro-

cess is continued for three or four minutes, depending on the heat of the pan, or until the leaves feel hot and soft. They are then with one sweep of a bamboo brush, (fig. 5,) swept into a basket (fig. 6,) and thrown on to the rolling table, which is covered with a coarse mat made of bamboo (fig. 7). Each manufacturer then takes as much as he can hold in both hands, and forms a ball, and commences to roll it with all his might with a semicircular motion, which causes a greenish-yellow juice to exude. This process is continued for three or four minutes, the balls being occasionally undone and made up again. The balls are then handed to another party at the extremity of the table, to undo them and spread the leaves out thinly on flat baskets, and expose them to the sun, if there is any, if not they are kept in the manufactory. After all the leaves have gone through this process the first baskets are brought back, and the leaves again transferred to the pan, worked up in a similar manner for the same length of time, retransferred to the table, and again rolled. This being done, the leaves are again spread out on large flat baskets to cool. On being cooled the leaves are collected together and thinly spread out on flat wicker-worked sieve baskets (fig. 9), which are placed in others of a deep and of a double-coned shape. The *choolahs* (fig. 12) being lighted for sometime, and the charcoal burning clear, they are now ready to receive the coned baskets. The basket is placed over the *choolah* and kept there for about five minutes. The leaves are then removed, retransferred to the flat baskets, and re-rolled for a few minutes. This being done, the leaves are again brought together, placed in the conical baskets and kept over the charcoal fire for about two minutes. The contents of the conical baskets are then all collected together in a heap, and as much is placed in a conical basket as it will hold, and it is again placed over the charcoal *choolah* until the tea is perfectly dry. During this time the baskets are frequently removed and the tea turned, in order to allow the leaves to be completely and uniformly dried, and the basket too is generally struck, on removal, a violent side blow with the hand, to remove from the sieve any small particles that might otherwise fall into the fire. Before removing the basket from the *choolah*, a flat basket is always placed on the floor to receive it, and all the particles which pass through, on the coned basket being struck, are again replaced. On the conical basket being filled, before placing it over the *choolah*, a funnel is made in the centre of the tea with the hand, to allow the heated air to pass through. Sometimes a funnel made of bamboo (fig. 13) is made for this purpose. After the tea feels perfectly dry, it is packed in boxes and sent to the godown.

53. Next day the different kinds of tea are picked, and on being separated they are again placed in the conical baskets and heated. During this process the baskets are frequently removed from the *choolah* in order to turn the tea, so that the heating may be general and uniform. In doing this, a flat basket is always placed on the floor, as on the former day, (and a flat basket too is placed on the top to confine the heat) to receive the conical one, which receives one or two blows to open the pores of the sieve. What passes through is replaced amongst the tea. When it is perfectly dry, it is ready for finally packing.

The kinds of black tea at present manufactured are—Souchong, Pouchong, Flowery Pekoe, and Bohea. The Flowery Pekoe is manufactured in September.

XVII.—*On the method of Manufacturing Green Tea.*

54. On the young and fresh leaves being plucked, they are spread out on the ground of the airing room and allowed to cool. After remaining for about two hours, or (if brought in late in the afternoon) during the night, they are removed to the green tea room (see No. 4, fig. *a*.) The pans being properly heated, the leaves as in the case with the black tea,

are thrown into the pans (fig 4 *a.*), and kept either with the hand or two forked sticks in constant motion for three or four minutes, and are then removed to the rolling table, and then rolled in the same manner in balls as the black tea. They are then scattered most sparingly on large flat baskets (fig. 8,) and exposed to the heat of the sun. If there is no sun, the baskets are arranged in frames, which are placed over the *choolah*, heated with charcoal. During the drying, the leaves are frequently made into balls and rolled in the flat baskets, in order to extract the juice. The drying process continues for about two hours, and on the leaves becoming dry, those contained in two baskets are thrown together, and then four basketsful into one, and so on until they are all collected together. In this state the leaves still feel soft, damp, and pliant to the hand, and are now brought back to the tea manufacturing room. Opposite to each of the inclined pans, (fig. 14 *a.*), which have been properly heated, so as to feel warm to the hand, by wood supplied to the ovens (*A*, fig. 14) underneath, one of the Chinese stations himself, and puts as many leaves into it as it will hold. He then moves them in a heap gently, from before backward, making these perform a circle, and presses them strongly to the sides of the pan. As the leaves become hot, he uses a flat piece of wood, in order that he may, more effectually, compress them. This process continues for about two hours, the leaves being compressed into at least, half of their bulk, and become so dry, that when pressed against the back part of the pan in mass, they again fall back in pieces. The tea, as by this time it has assumed this appearance, is now placed in a bag made of American drill or jean (the size depending on the quantity of tea), which is damped, and one end is then twisted with much force over a stick, and thus it is much reduced in size. After being thus powerfully compressed and beaten so as to reduce the mass as much as possible, the bag is exposed to the sun until it feels perfectly dry. If there is no sun it is placed in the heated pan, and there retained until it is so. This finishes the first day's process.

55. On the second day it is placed in small quantities in the heated inclined pans, and moved up and down against the sides and bottom with the palm of the hand, which is made to perform a semicircle. This is continued for about six hours, and by so doing, the color of the tea is gradually brought out.

55½. Third day. It is passed through sieve baskets of different dimensions, then exposed to the winnowing machine, which separates the different kinds of green teas. The winnowing machine is divided into a series of divisions which receive the different kinds according to their size and weight.

1st. Coarsest, Souchoo. This tea, owing to its coarseness, is not marketable.

2nd. Chounchoo. This is a large, round-grained tea.

3rd. Machoo. This is also a round-grained tea, but finer than the former.

4th. Hyson.

5th. Gunpowder Hyson.

6th. Chumat. This kind of tea consists of broken particles of other kinds of tea.

56. On being separated, the different kinds of teas are placed in baskets, and picked by the hand, all the old or badly curled, and also light-colored leaves being removed, and others of different varieties, which by chance may have become mixed. To make the bad or light-colored leaves marketable, they undergo an artificial process of coloring,* but this I have prohibited in compliance with the orders of the Court of Directors, contained in your letter No. 190, dated 5th March 1845, and therefore do not consider this tea at present fit for the market. On the different teas being properly picked, they are again placed in the heated inclined

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* In China this process, according to the statement of the tea manufacturers, is carried on to a great extent.

pans, and undergo separately the process of being moved violently up and down and along the bottom of the pan, for three hours, in the manner already described. The color is now fully developed. If the tea feels damp, it is kept longer than three hours in the pan. The tea is now ready to be packed.

XVIII.—*Packing Tea.*

57. As soon as the tea is prepared, boxes lined with sheet lead ought to be ready to receive it.

58. On being packed, it is to be firmly pressed down and the lead is then to be soldered. Before the sheet lead box is placed in the wooden one, it is covered with paper, which is pasted on to prevent any air acting on the tea, through any holes which might exist in the lead. The box is then nailed, removed to the godown, papered, stamped, and numbered. It is then ready for sale.

59. From what I have just stated it will be perceived, that box makers and sheet lead makers are essential to form a complete tea establishment. With reference to the box-making, it is unnecessary for me to make any remark, further than that care is to be taken in selecting wood for making boxes, as it ought to be free of all smell. All coniferous (pine) woods are therefore unfit for the purpose. In the hills the best woods are toon and walnut, and at Deyrah the saul *(Shorea robusta)*.

XIX.—*Manufacture of Sheet Lead.*

60. Sheet lead making is a much more complicated process, and therefore requires some consideration. To make sheet lead the manufacturer mixes 1½ to 3 seers of block tin with a pucka maund of lead, and melts them together in a cast metal pan. On being melted, the flat stone slabs, under which it is his intention to run the lead, are first covered with 10 or 12 sheets of smooth paper, (the hill paper being well

adapted to the purpose) which are pasted to the sides and chalked over. He then places the under stone in a skeleton frame of wood to keep it firm, and above it the other stone. On the upper stone the manufacturer sits and gently raises it with his left hand, assisted by throwing the weight of his body backwards. With his right hand he fills an iron ladel with the molten matter, throws it under the raised slab, which he immediately compresses and brings forward, (it having been placed back, and thus overlapping the under slab by about half an inch) with his own weight. On doing so the superabundant lead issues in front and at both sides, what remains attached to the slabs is removed by the iron ladel. The upper slab is now lifted, and the sheet of lead examined. If it is devoid of holes it is retained. If on the other hand, there are several, which is generally the case with the first two or three sheets run, or until the slabs get warm, it is again thrown. back to the melting pan. After having run off a series of sheets, the slabs are to be examined, and if the paper is in the least burnt the first sheet is to be removed, and the one underneath taking its place, and thus securing an uniform smooth surface, is then to be chalked. According to the size of the stone slabs used, so is the size of the sheet lead. Those now in use are 16 inches square, by 2 inches in thickness, and are a composition, being principally formed of lime.

61. To make sheet lead boxes, a model one of wood, (a little smaller than the box for which the lead is intended) is formed, which has a hole in the bottom, and a transverse bar of wood to assist in lifting it up, instead of a lid. The lead is then shaped on this model and soldered. This being done, the model is removed by the transverse bar, and by pressing, if necessary, through the hole. The lead box is then papered over in case there should be any small holes in it to prevent the action of air on the tea, and when dry, transferred to the wooden box, for which it was intended.

XX.—*Tea Manufactory.*

62. The rooms of the tea manufactory ought to be large and airy, and to consist of 1st, a black tea manufactory, 2nd, a green tea manufactory; 3rd, winnowing room; and 4th, airing room. At Almorah the black tea manufacturing room is 53 feet long by 20 broad (see No. 4), and the other three, 20 by 24. The walls are 18 feet in height. The ground-plan shows how the ovens and *choolahs* are arranged. *A, A,* ovens for making black tea: *B,* ditto for green tea: *C, C, C,* ditto green tea: and *D, choolahs.*

XXI.—*Implements required in Manufacturing Tea.*

63. In the body of this report I have noticed all the different kinds of implements required. I may however again briefly notice them, and give a short account of each. (Figs. 1 and 2,)—Cast iron pans. In the manufactory there are two kinds in use, one received from China, the other from England. Both are considered equally good by the tea manufacturers, though in firing green tea they prefer the Chinese ones, as they are thinner, and are thus by them better able to regulate the heat. The Chinese pans (fig. 1,) are 2 feet 2 inches in diameter, and 10 inches in depth, by about $\frac{1}{8}$ of an inch in thickness.

64. The English pans (fig. 2,) are 2 feet 2 inches in diameter and 8 inches in depth, and rather thicker than the Chinese.

65. (Fig. 3.) The oven for making black tea (fig. 3 *a.*), of which a lateral view to show the door is given, is made of *kucha* brick. In height it is 2 feet 9 inches, in length 3 feet, and in breadth 3 feet 1 inch. Door (*a*) 1 foot 5 inches in height, and 11 inches in breadth. The base of the oven is 10 inches, elevated above the floor of the manufacturing room.

66. The oven with double pans for manufacturing green tea, (fig. 4,) is also built of *kucha* bricks. It is 3 feet in height

and 3 feet in breadth: base of oven 1 foot in height. Door 1 foot 6 inches in height, and 10 inches in breadth. The pans are placed horizontally.

67. Fig. 5. Brush made of split bamboo used in sweeping the tea leaves out of the pans.

68. Fig. 6. Basket for receiving tea from the pan when ready to be rolled. It is 2 feet long and 1½ feet broad, and gradually increases in depth from before backwards to 6 inches. It is made of bamboo.

69. Fig. 7. Mat made of bamboo for placing on the table when the tea leaves are about to be rolled. It is 8 feet long and 4 feet broad.

70. Fig. 8. Flat basket made of bamboo for spreading out the tea leaves when they have been rolled on the mat. These flat baskets are of various sizes, varying from 3 to 5 feet in diameter.

71. Fig. 9. Flat sieve basket, of 2 feet in diameter, made of bamboo, upon which the rolled tea leaves are placed, and which is deposited in the centre *A*, of the double-coned basket.

72. Fig. 10. Double-coned Baskets. The height of these baskets varies from 2 feet 2 inches to 2 feet 6 inches, external diameter 2 feet 8 inches. In the centre at *a*. there are some small pegs of bamboo to support the flat sieve basket on which the tea rests.

73. Fig. 11. Forked stick for turning leaves.

74. Fig. 12. *Choolahs*. These are formed of *kucha* bricks, and are 10 inches high, 10½ inches deep, and generally about 2 feet in diameter, in (fig. 12 *a*.) a double-coned basket is represented placed on a *choolah*.

75. Fig. 13. Funnel made of bamboo to allow the heated air from the *choolahs* to pass through the tea: it is seldom used. The Chinese tea manufacturers preferring one made in the tea basket by the hand.

76. Fig. 14. Oven for firing green tea made of *kucha* bricks. The pans *a, a*, are inclined at an angle of 50°. In front the

oven is 3 feet 2 inches in height, behind 4 feet 8 inches, length 5½ feet, breadth 3 feet. Door 10 inches from the base, 1 foot 2 inches high, and 7 inches wide.

77. Figs. 15, 16. Frames for placing baskets. The first being inclined.

78. Figs. 17, 18. Baskets for collecting leaves.

79. Figs. 19, 20, and 21. Shovel, &c. used in regulating the fire.

80. Fig. 22. Winnowing machine. This is a common winnowing machine, with a box 2 feet 10 inches in length, 1 foot 2 inches in breadth, and 1 foot 3 inches in depth, attached to the bottom of the hopper, and closely fitted into the middle of the circular apartment which contains the fanners. This box is entirely closed above (unless the small opening receiving the hopper) and at the sides. At the base there are two inclined boards which project from the side of the machine 6 inches, and are partly separated from each other by angular pieces of wood. The end towards the fanners is open, the other is partly closed by a semicircular box which is movable.

81. *A, A, A.* Apartment containing fanners which is all closed but at *B* and *C.* *D,* handle or crank for propelling fanners. *E,* apartment through which the air is propelled from the open space *B,* in the direction of the arrows. *F,* hopper. *G,* flat piece of wood to regulate hopper. *H,* angular piece of wood to shut the hopper by being placed under the regulator. *I, L,* base of ten receiving apartments, divided into two compartments, and projecting laterally and obliquely downward for 6 inches, and down which the tea proceeds. *N,* semicircular movable box, which receives all the lighter particles of tea. *K, M, O,* boxes placed to receive the tea.

82. I shall now give the dimensions of the different parts of this machine which may be useful to parties wishing to make up similar ones to those employed in the manufactories.

83. External frame, 7 feet 2 inches in length, 18 inches in breadth, and 5 feet 8 inches in height. Hopper 2 feet 10 inches above, and 1 foot 8 inches in depth. Frame of box of fanners, 3 feet 9 inches in diameter. Hopper frame 2 feet 7 inches. Semicircular box, in length 2 feet 5 inches and 7 inches in depth. Inclined plane at base, first 15 inches, second 13 inches.

84. I may briefly state how this machine acts. With the right hand the fanners are propelled by the crank at *D*, and with the left hand the bottom of the hopper is opened by removing the wood at *H*. The flat piece of wood *G*, (the regulator) is held in the hand to regulate the quantity of tea that passes down. An assistant then throws a quantity of tea into the hopper (fig. *F*), which escapes through the bottom into the apartment *E*, and there meets the air marked by arrows. The first kinds of tea fall down the inclined plane *I*, into the box *K*, which has been placed to receive them, the second are propelled further on, and fall into the box *M*, and the lighter particles are propelled on to the semicircular end *N*, and fall into the box *O*.

XXII.—*Concluding Remarks.*

85. In concluding this report, I must beg to acknowledge the assistance that I have received from Mr. George Lushington, who takes a lively interest in the extension of the experiments now conducting. To Captain H. Ramsay, Senior Assistant Commissioner, Gurwahl, I am indebted not only for assistance in clearing the jungle in order to extend the tea plantation at Guddowli, but also for the interest he has evinced in bringing about a tea trade with the Bhotiahs of Niti Bampa, Mulari and other frontier towns. At his suggestion several boxes of Bohea tea were made over to the principal men of the above villages, and which have been by them exported to Dhumpoo, in Chinese Tartary, for sale. The Bhotiahs on the Kumaon frontier have also been encouraged

by Mr. Batten, Senior Assistant Commissioner, to purchase Bohea tea for a similar purpose, and to them six boxes have been sold. The result shall be the subject of a future communication.

Wm. Jameson,
Supt. Bot. Gardens, N. W. P.

Office of the Supt. Bot. Garden, N. W. P.:
Camp Kumaon, 30th July, 1847.

APPENDIX (A.)

List of Boxes of Tea sold by Auction at Almorah, on the 22nd July, 1846.

No. of boxes.	Description of Tea.	Year of Manufacture.	Quantity.		Name of Purchasers.	Rate per pound.			Amount.		
			lb.	oz.		Rs.	A.	P.	Rs.	A.	P.
23.	Pouchong,	1844,	10	„	Moti Saha, ...	2	4	0	22	8	0
24.	Ditto,	„	10	„	J. Strachey, Esq., ..	2	13	0	28	2	0
25.	Ditto,	„	10	„	Ditto ditto, ...	2	13	0	28	2	0
26.	Ditto,	„	10	„	Ditto ditto, ...	3	1	6	30	15	0
27.	Ditto,	„	10	„	J. H. Batten, Esq., ..	3	1	0	30	10	0
28.	Ditto,	„	10	„	Moti Saha, ...	3	4	0	32	8	0
29.	Ditto,	„	10	„	Ditto ditto, ...	3	4	0	32	8	0
30.	Ditto,	„	10	„	J. H. Batten, Esq., ..	3	4	6	32	13	0
31.	Ditto,	„	6	„	J. Strachey, Esq., ..	3	10	0	21	12	0
22.	Ditto,	1845,	10	„	Seeram Saha,.. ..	3	6	6	34	1	0
23.	Ditto,	„	10	„	J. Strachey, Esq., ..	3	8	6	35	0	0
24.	Ditto,	„	10	„	Moti Saha, ...	3	8	6	35	0	0
25.	Ditto,	„	10	„	Seeram Saha,.. ..	3	8	6	35	0	0
26.	Ditto,	„	10	„	Moti Saha, ...	3	8	6	35	0	0
27.	Ditto,	„	10	„	J. H. Batten, Esq., ..	3	9	0	35	10	0
28.	Ditto,	„	10	„	Mr. Dunbar, ...	3	9	0	35	10	0
29.	Ditto,	„	10	„	J. H. Batten, Esq., ..	3	10	0	36	4	0
30.	Ditto,	„	10	„	J. Strachey, Esq., ..	3	9	0	35	10	0
31.	Ditto,	„	10	„	Moti Saha, ...	3	9	0	35	10	0
32.	Ditto,	„	10	„	Ditto ditto, ...	3	9	0	35	10	0
34.	Ditto,	„	10	„	J. Strachey, Esq., ..	3	9	6	35	15	0
35.	Ditto,	„	10	„	Ditto ditto, ...	3	9	0	35	10	0
36.	Ditto,	„	10	„	J. H. Batten, Esq., ..	3	9	0	35	10	0
37.	Ditto,	„	10	„	Ensign Norman, ..	3	10	0	36	4	0
38.	Ditto,	„	10	„	Seeram Saha,.. ..	3	9	6	35	15	0
39.	Ditto,	„	10	„	Moti Saha, ...	3	9	0	35	10	0
40.	Ditto,	„	10	„	Seeram Saha,.. ..	3	9	6	35	15	0
41.	Ditto,	„	10	„	Mr. Dunbar, ...	3	9	6	35	15	0
43.	Ditto,	„	10	„	Moti Saha, ...	3	9	0	35	10	0

APPENDIX (A.)—*(Continued.)*

List of Boxes of Tea sold by Auction at Almorah, on the 22nd July, 1846.

No. of boxes.	Description of Tea.	Year of Manufacture.	Quantity.	Name of Purchasers.	Rate per pound.	Amount.
			lb. oz.		Rs. A. P.	Rs. A. P.
44.	Pouchong,	1845,	10 „	Moti, Saha, ...	3 9 0	35 10 0
45.	Ditto,	„	10 „	Ditto ditto, ...	3 9 0	35 10 0
46.	Ditto,	„	10 „	Ditto ditto, ...	3 9 0	35 10 0
48.	Ditto,	„	10 „	G. T. Lushington, Esq.,	3 10 0	36 4 0
49.	Ditto,	„	10 „	Moti Saha, ...	3 9 0	35 10 0
51.	Ditto,	„	10 „	Ditto ditto, ...	3 9 0	35 10 0
52.	Ditto,	„	10 „	Ditto ditto, ...	3 9 0	35 10 0
53.	Ditto,	„	10 „	Seer[illegible] Saha, ...	3 9 6	35 15 0
54.	Ditto,	„	6 „	Mr. Dunbar, ...	3 11 6	22 5 0
..	Total, lb.	..	372 „	Total, ...	Co's. Rs.	1,280 5 0

(Signed) D. Mallach, *Sergt. Major, Auctioneer.*

Almorah : 22*nd July*, 1846.

(True copy,)

Wm. Jameson,

Supt. Botanical Gardens, N. W. P.

On the culture of American Cotton in India, and the proper time for sowing it in various localities. By Dr. Robert Wight, *Superintendent Government Cotton Farms, Coimbatore.*

A week's absence from home visiting our farms, which are located some miles from Coimbatore, has prevented an earlier acknowledgment of your letter. These, I am happy to add, are all advancing favorably, and promise satisfactory returns. The only portion regarding which I have as yet any doubts are two or three fields sown earlier than I consider quite judicious. This measure was adopted experimentally in accordance with a suggestion from the Manchester Commercial Association, based on a knowledge of the habits of the plant as observed in its native country, Mexico, but which seems scarcely applicable to these portions of India under the influence of the NE. monsoon.

The facts communicated by the Association, combined with the knowledge acquired here, of the habits of the plant, has induced me to endeavour to ascertain some general rule applicable to all localities, for determining the proper time for sowing American cotton in India.

Circumstances which were by their consequences deeply impressed on my memory, occurred at an early stage of our proceedings here, and have hitherto served as a guide to our subsequent operations, but empirically, not on any ascertained fixed principle. From the information then and since obtained from all quarters, I have recently deduced a theory applicable to all stations, which, being based on the known habits of the plant, must be correct. I am almost quite prepared for being laughed at for introducing my formula! with all the seriousness of a real discovery, considering that it is neither more nor less than a self-evident truism; but still, it is one which, I do not think has been kept sufficiently in view in the management of these cotton experiments, and the want of attention to its bearing on them, has, I suspect, led to the belief that, in India, American cotton is a less certain crop than it really is, when the principle about to be stated is duly kept in view.

I find that in the climate of Coimbatore, the Mexican, or, as now generally called, the New Orleans cotton plant, requires, in average seasons, from the time of sowing until the expansion of its first blossoms, from six to eight weeks, and from the fall of the flower to the bursting of the mature capsule, about as much more. The first of these periods may vary, though not materially, according to the soil, the situation as regards exposure to high winds, the quantity of rain; and it may be delayed or advanced a little by agricultural treatment.

From fourteen to sixteen weeks may therefore be assumed as the period that intervenes between the sowing and first pickings of the crop. At the end of that time, the weather during the interval having been seasonable, and the monsoon of average quantity, so as properly to soak the ground, the plant should be in full vigour, nearly full grown, and loaded with crop in all stages, from the embryo form to the open bole ready to pick. This is the critical period of the crop. Should the rains cease and be followed by bright clear weather, the full grown boles will rapidly open and fresh ones continue to advance for two, three, or if the plants have been refreshed by an occasional shower, even four or five months, and in the end, on good lands, yield probably as much as a thousand pounds per acre. But if on the other hand the rains are protracted for a week or two longer, the plants become overcharged with watery juices, the more advanced boles constituting the finest portion of the crop do not open, the cotton absorbs moisture from the capsule, which, having no means of escape, rapidly rots or otherwise deteriorates its quality. From this history of the progress of a cotton crop from the seed to the ripe bole, it will be seen that we must endeavour so to arrange our sowings as to allow a growing season of from twelve to fourteen weeks to intervene between the date of sowing and expected conclusion of the monsoon. The sooner our pickings commence after the rains have ceased the better will be our crops.

Guided by the facts on which the principle rests, and knowing that the NE. monsoon in these western districts is usually of short duration, I consider July the most favorable month for sowing. August would probably be preferable if we could equally depend on having rain, an expectation which four years' experience does not justify, as in that case we could almost make sure of escaping the destructive effects of a late or excessive NE. monsoon. This season, as above stated, two fields were sown on the first of June, two more on the 15th; and about the 25th of that month, the regular sowings commenced and continued until nearly the end of July. One farm, situated more in the direct line of the SW. monsoon, had much more rain than the other, which delayed the work, so that it was not finished until the 10th of August, thus affording us a continuous series of sowings, extending over two consecutive months to compare with each other as to final result. One low-lying field is still reserved to a later date, as wet lands are unfavorable for the cultivation of cotton by producing effects similar in kind to those arising from unseasonable rains on dry ones. In a word, I have never found cotton succeed well on what is technically called a "wet bottom;" the plant grows well, but the crop always falls short, and much of the staple is damaged. The fields sown on the 1st and 15th June are now far advanced, the former in full flower and many nearly half-grown boles to be met with, which should be ripe about the end of September, in which case the bulk of the crop will be coming on in October, about the time of our heaviest rains; and if they are in average quantity, I anticipate the greater part will be lost.

In applying this rule to other portions of India it may, I think, be laid down as a rule that, all along the eastern coast of the Peninsula, the last week of August and all September will be found favorable for sowing: the NE. monsoon being much more abundant and of longer duration there than in the interior. And in countries subject to the SW. monsoon, the last week of May and all June will probably be found the most suitable seasons: the exact time being determined by the individual season and average duration of the rains at each station.

Cases will of course often happen, where, owing to favorable rains occurring at a season which may be considered a little too early to be quite safe, the cultivator may be perplexed, not wishing to lose a favorable opportunity which might be withheld at the proper time. In such cases the safer plan is to advance, as the plant is one possessed of great power of resisting heat and drought should they follow, and is ever ready to take advantage of the first rains that fall: if on the contrary the weather continues moist, and there is danger of the plant advancing too rapidly, its progress may be, to a considerable extent, retarded by delaying to hoe and loosen the soil about the roots, which certainly produces that effect. If, on the contrary, the sowing is unavoidably delayed, the loss of time can be materially compensated by early and repeated hoeings.

The course adopted here is to hoe and thin out to about half what will be required as soon as the first or second proper leaves (between the seed lobes) begin to show themselves. That is, in about ten days or a fortnight after the plant is above ground: in about a fortnight or three weeks after, the plant being then four or five inches high, the ground between the rows is loosened by being ploughed with the native plough: and lastly, in two or three weeks more, they get their second hoeing and final thinning. From this time little is required except in fields overrun with grass and weeds, in which case these operations require to be repeated.

Before finally quitting the subject, I may mention with regard to Bourbon cotton, that I have not yet ascertained with equal certainty its rate of progression towards maturity, and cannot state with the same precision the time that should be allowed for its growing season. But knowing that it is much slower than the American plant, I had it this year sown about the middle of May, thereby giving it a longer season by fully six weeks. The whole of that time, judging from the present comparatively backward appearance of the plant, will be required to bring it into crop about the same time with the New Orleans, its growth being so much slower.

August 16*th*, 1847.

Note on the culture of the Tea Plant at Darjeeling. By Dr. A. Campbell, *Superintendent of Darjeeling.*

I feel assured that it will interest the Society to know that I have instituted an experiment on the culture of the tea plant at this place. It is my intention to keep the Society informed on its progress, and I shall therefore note particulars from the beginning.

About six years ago I received a few tea seeds from Dr. Wallich; they were of China stock, grown in Kumaon. I planted them in my garden in the month of November 1841, and had about a dozen seedlings in the month of May following, which were allowed to grow where they had come up, and rather close together. The plants were healthy from the commencement, and up to May 1844 had grown very well: at this period the ground passed into other hands (Mr. Samuel Smith's), and I lost sight of them until last August, when Mr. Macfarlane from Assam, who was acquainted with the tea plant in that province, arrived here. Being desirous of ascertaining how far the climate and soil of Darjeeling were suitable to the tea I took him to examine the plants, and begged of him to record his opinion on their growth and qualities with reference to their age and his experience of the plant in Assam. The result was quite satisfactory, as Mr. Macfarlane concluded his note on the subject by saying, that the plants were in a very healthy condition, and had they been in the hands of a cultivator, would now be giving a very fair supply of produce. Encouraged by this result I determined to give an extended trial to the plant, and through the kindness of Major Jenkins and Captain Brodie of Assam, I procured a supply of fresh seed in October and November last, which was planted in November and the early part of December.

The seed was of excellent quality. It commenced germinating in March, a few plants appeared above ground in the early part of May, and now I have upwards of 7000 fine healthy seedlings in the plantation.

For the information of those who may desire to try the tea culture in this soil and climate, I have to state the mode of planting pursued by me, and other particulars. The ground is a gentle sloping bank, facing the north and west; the soil is a reddish clay mixed with vegetable mould. After taking up a crop of potatoes, and carefully preparing the ground, I put in the seed in rows six feet apart and six feet distance in the rows. The seeds were placed about three inches under the surface, five in number, at each place about four inches apart thus ⁙ On an average, two out of the five have come up. The seedlings commenced appearing above ground early in May, and continued to show until the end of July. The earliest were therefore six months in the ground; the latest about eight months.

The seed was of China stock, grown in Assam, and of the Assam plant mixed. I am anxious to have the China stock only, and purpose separating the plants of the Assam stock as soon as I can distinguish them, which Capt. Brodie informs me, can be readily done as they grow up: the China plants being of a darker color, and smaller than the Assam ones.

I hope to have a supply of the seed of China stock from Kumaon next November, and with it to cause the extension of the experiment at this place. If the Society has any suggestions to make, I shall be most happy to attend to them.

I think that it is reasonable to expect quite as good tea to be produced here as in Kumaon.[*] I have not tasted the Kumaon tea, but from the opinion expressed on it in England, I am satisfied that it is a very drinkable beverage, and that with similar success here, the tea will be a valuable addition to

Dr. Jameson, in a late communication to the Society, remarks—"From the accounts I have received of the climate of that place (Darjeeling), I doubt not but that the plant there grown will yield tea of a superior description."—Eds.

our products. If you can send me a sample of Kumaon tea I shall be much obliged. I have recently tried two kinds of the Assam tea presented by Mr. Stokes to a friend. They are excellent teas, and I shall be well content to have an equally good article manufactured here.

Mr. Macfarlane's report on the tea plants in Mr. Smith's ground is annexed.

August 13*th*, 1847.

According to your request I have the pleasure of transmitting you my opinion of the tea plants in your garden in this place. The two larger plants have made very good progress, considering their closeness to each other, which prevents them from throwing their branches freely in every *direction*, but as they have attained so great a size, I would not recommend their being transplanted; because, let it be done ever so carefully, the roots must receive more or less injury, and should the injury be great the death of the tree is certain.

The smaller ones on the contrary are much stunted; this is caused by their confined situation, being completely choaked up by the rose trees, which prevents their receiving a proper supply of light and air so necessary to vegetation. They are also planted too closely, and, as the plants are still small, by availing yourself of the most favorable season, and using great care in the operation, they might be transplanted with safety, and should then be placed at a distance of not less than six feet apart. The difficulty of transplanting is occasioned by the depth to which the root penetrates, as it generally grows downwards, and in a large tree is principally in the subsoil. The larger plants should be pruned of their lower branches to allow a free current of air. This operation is generally performed in November, but any time during the cold season or before the rains, while the plant is at rest, would answer:

as I have no knowledge of this climate, I would leave it to more experienced persons to judge of the proper season. To conclude, the plants are in a very healthy condition, and had they been in the hands of a cultivator, would now have them giving a very fair supply of produce.

The small sample I tried was of a very good flavor, but on account of the defective manner of manufacture, for want of proper materials, no proper judgment can be formed.

(Signed) A. MACFARLANE.

August 18th, 1846.

On the export of Wheat from India to England. By Professor ROYLE.

[Communicated by the Government of India.]

Wheat, having been known to the earliest of the civilized nations of antiquity, is probably a native of the central parts of Asia, whence its cultivation has been carried north into Europe, and south into India, presenting, what appears to us, the anomaly of a grain of cold countries being cultivated in what is so peculiarly a hot one. It has sometimes been thought that the species might be different, but it is in fact, the season of cultivation which differs. Wheat, with barley, being sown in the plains of India in the month of October, and reaped in March, while in the Himalayan Mountains, these are sown in the spring, and reaped in autumn.

Great varieties of wheat are known in Europe, which are sometimes divided into summer and winter wheats, and the latter into red and white wheats, and also into those which are bearded and awnless. But all these are now considered to be derived from one species, the *Triticum vulgare* or *sativum* of botanists. To this may be referred nearly all the varieties known in India. A few other species of wheat are distinguished by botanists as *T. turgidum,* or duck-bill wheat; *T. durum,* or Barbary wheat; *T. amyleum,* starch wheat, and *T. compositum,* or Egyptian wheat; but these, and even the last, differing so remarkably in appearance as it does, are thought by others to be only varieties due to the varied culture of common wheat. *T. polonicum*, or Polish wheat; *T. spelta*, spelt wheat, and *T. monococcum*, or one-grained wheat, appear to be distinct species.

Though the produce of wheat cultivation varies according to the influence of soil and of climate, as well as according to the culture, and to the kind of manure employed, as also the variety of seed employed, yet it is sometimes useful, for the sake of comparison, to know what is the average rate of product. It has sometimes been calculated that the weight of straw is double that of grain obtained. Professor E. Solly states, that "a crop yielding 5 qrs. (or 40 bushels) per "acre, would consist of about 23 cwt. of grain, 4 tons of straw, and "30 cwt. of stubble and roots; the latter of course remaining in "the soil."—*Rural Chemistry*, p. 213. Of grain, the maximum return per acre is about 70 bushels, but the average return for the whole of Great Britain is reckoned to be about 25 bushels per acre. The grain is readily separated in the process of grinding into two portions, one, the husk forming bran, which varies in proportion from 11 to near 40 per cent. to the kernel, or part which forms flour. In good thin-skinned and *soft* wheats, the husk is easily separated, but in those which are *hard*, some of the husk becomes ground up with the flour, and darkens its color. But bran always contains a portion of starch and other soluble matters.

When analyzed, English wheat is found to contain from 15 to 17 cent. of water, or about one pound in every six pounds of fine flour; also, starch, with a little sugar and gum, and gluten, with a little vegetable albumen and caseine, with some oil, which is partly washed out with starch, while a part remains attached to the gluten. These constituents may be distinguished into those which contain nitrogen, that is, the gluten, albumen and caseine: and into those which are destitute of it, as the starch, sugar, gum and oil. The nitrogenous principles approaching nearest to the nature of the flesh of animals, are considered the most nutritious; and wheat, for containing more gluten, &c., than other grains, is considered the most nutritious of any: but in England, the wheats which contain the most gluten are not so much esteemed as those which abound in starch, chiefly in consequence of these being softer, and producing a whiter flour. The glutinous wheats are chiefly produced in warm countries as Sicily, Italy and the Crimea: they are harder in nature, hence called *flinty*, and, being more difficult to grind, are objected to by millers. But they are preferred in southern countries for their nutritious qualities, also for making excellent macaroni, vermicelli, and also biscuit. They also make about 5 per cent. more of bread than the white mealy wheats. Professor Johnston (Agricultural Chemistry, p. 732) states, that "the quality of gluten contained "in English flour has generally been stated much too high:" it "seldom contains more than 10 per cent. of dry gluten."* As wheat forms the principal food of the inhabitants of North-west India, and is cultivated in many parts of that country, it has often been suggested as a profitable export to England, and that the improvement of its quality and culture was a subject well worthy of attention. The Agricultural Society of India has frequently turned the notice of its members to this subject, and obtained wheat for seed from England as well as other countries. Wheat, as well as other cereal grains, has also been frequently sent in small quantities from the India House to different parts of India.

That it has been thought practicable to export wheat from India to Great Britain with profit, may be inferred from the petition to Parliament from the Agricultural Society of India, praying for "the "admission into the ports of Great Britain of wheat from this "country, on the same terms as have already been conceded to wheat

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* In addition to English wheat, it is desirable to know the composition of wheats of other countries, as some of these approximate nearer to the wheats of India. The accompanying table is therefore given.

Table of the composition of French and Odessa flour, as determined by Vauquelin.

	French.	Odessa Wheat.	
	1st Quality.	Flinty.	Soft.
Water, ...	10·0	12·0	10·0
Gluten, ...	11·0	14·6	12·0
Starch, ...	71·5	56·5	62·0
Sugar, ...	4·7	8·5	7·4
Gum, ...	3·3	4·9	5·8
Bran, ...	..	2·3	1·2
	100·5	98·8	98·4

"from Canada." *A Committee of the Society had previously collected information from various districts of Bengal and of the North-*Western Provinces, on the cost of producing, and on the practicability of exporting, wheat in a good condition with profit, from India to England. The Committee reported (vide Trans. Agric. Soc. 1843, pp. 237-318,) that "some of the finest wheat countries are to be found "in the vicinity of our Calcutta market; but beyond Behar, the dis-"tance would appear to be too great to allow of a profitable import at "the present high rate of transport." From the nearer districts, it appeared that wheat could be landed in Calcutta for Rs. 1 to Rs. 1-12 per maund: its average being Rs. 1-5-6. The average selling price at Calcutta for the year was then Rs. 1-13-4; whence it was calculated, that a profit of 37 per cent. was available to the grower or country dealer. "The returns from the higher provinces show a "range of from Rs. 1-10 to Rs. 2-12 per maund as the price of "landing good wheat in Calcutta. Its average being Rs. 2-1-2; "showing an advance on the Calcutta rate before stated (Rs. 1-13-4) "of 3 annas and 11 pie, or a loss of more than 12 per cent." The Committee further observe—"Besides this, the residents of the "higher provinces being themselves large wheat consumers, we can "hardly expect perhaps for sometime to come, that much wheat will "be drawn thence for export." The greater cheapness of the wheat cultivation of the lower provinces is due in a great measure to its being carried on in the land near the banks of rivers, which has been inundated during the rainy season, and has not there completely dried up. The greater dearness of the North-West Provinces seems to be chiefly owing to the greater expense of irrigation, as two or three of the reporters state, that the cultivation could be greatly extended and the price of wheat much cheapened, if the Ganges canal were completed. The culture, though upon the whole careless, seems to give good returns, as the produce per acre of many villages is stated to be above 25 bushels per acre, of others as much as 42 bushels to the acre, and in one village of the Dooab, the produce is stated to be as high as 83 bushels per acre.

At the time that the above report was made, it was also calculated by others that the average cost of wheat at Calcutta being Rs. 1-12 per maund, which at a rough estimate is about 28 shillings a quarter, *and to which having added 25 per cent. for freight and other charges, the wheat could be landed in England for about 53 shillings a* quarter. *This was at a time when the best English wheats were* selling in England *for 55s.,* and the inferior kinds for 44*s*. a quarter.

Both previous and subsequent to 1843, small quantities of wheat have formed a part of the exports from India to England, and some has also been imported during the present year, but we are unacquainted with the details of any of the transactions. But it is evident, that, supposing it to be of such a quality that it is likely to travel well, it can only, at the above prices, be imported when wheat of the same quality is above 53 shillings a quarter. The quality of Indian wheat and the state in which it can reach England from India, will be considered in a subsequent part of this paper.

As the above information refers only to the Bengal Presidency, we have the "Notes on Indian Agriculture" by Dr. Gibson, which supply data for similar knowledge respecting the wheat cultivation of the Bombay Presidency. He states, that "wheat is grown chiefly "above the Ghats in the Dekkan, Khandesh, and the Carnatic, "also most extensively in Guzerat, even to the sea border. It is "also extensively raised in many level table-lands met with before the "Ghats, and often down to the flatter plains; and on such high levels, "the same measure of grain is found to weigh about one quarter more "than a similar quantity raised in the more plain country." The land best fitted for the culture, is the strong black soil, as it retains sufficient moisture to mature a crop even without the aid of after-showers. Rotation is "necessary and universally practised, but not "always until two or three crops in succession have been taken from "the ground." The crop is valued not only on account of the grain, but also for the chaff which "is carefully set apart as a most necessary provision for bullocks, and stored until the season when "other provender is scarce." Of the best varieties, *Bakshi*, is always raised on irrigated, and the *Daood Khani*, as "a dry crop, fitted only "for the best soil." "The produce does not generally exceed "1,200 pounds (20 bushels?) per acre, and is most frequently short "of this quantity." The price varies "from 60 to 90℔s. per Rupee, "i. e. it may be said to vary from 10 to 16*s*. per quarter."

We have further information from a Government experiment made in 1843 by Dr. Burn in Broach, in consequence of a portion of land under cotton cultivation having been thrown out of culture by excess of moisture. About 23 acres of land (46 beegahs) were sown with wheat in November and reaped by the middle of March. The produce was "742lbs. an acre, and, taking the bushel at 60lbs. then 12 "bushels and 22lbs. per acre." The expenses of culture, including and rent, were Rs. 532-10-3. A portion of the produce (the nferior wheat and chaff) was sold at Broach for Rs. 59-14-8. If the remainder had been sold there at the market price of Rs. 10 per 656lbs., the sum would have amounted with the above Rs. 59-14-8, to Rs. 277-14-2; entailing a loss of Rs. 254-12-1 upon the whole expenditure, or Rs. 5-8-7 upon each beegah. (Though anticipating, it may be here stated, that Rs. 157-2-0 were realized upon the whole produce, after paying all expenses.)

About 30 quarters of this wheat were sent to Bombay for shipment to England, as one of the objects of the experiment was to obtain definite information on the exporting of wheat from the west of ndia. The following expenses were incurred :—

Wheat grain, rate of cost.	Per Kulsi of 656 lbs.	Per Quarter of 480 lbs.
Cost of cultivation, ...	21 11 0¼	15 13 11
Packing and Shipping from Broach to Bombay,	4 8 2¾	3 4 10¼
Shipping, Insurance, &c. at Bombay, ...	2 7 3¼	1 12 8¾
Freight to Liverpool, ...	9 13 9¾	7 3 6
Total, ... Co's. Rs.	38 8 4	28 3 0

Dr. Burn states: "if the above sums be correct, then 56 or 57 shillings per quarter (the rate of exchange being about 2 shillings) will be about the cost of the grain in Liverpool, duty unpaid." But it must be observed, that at the same time that this wheat cost Rs. 21-11-0¼ per kulsi, wheat of the same quality was selling at Broach for Rs. 10 per kulsi of 657lbs. This, Dr. Burn explains, by the natives having no pecuniary charge for laborers, &c.," and ays, that "Rs. 10 per kulsi, although it admits of but small profit to the native cultivator, would allow of the grain being landed in Liverpool at Rs. 26-13-3¾ per kulsi, or Rs. 19-10-2 per "quarter," that is, under 40*s*. a quarter. But in 1845, when Dr. Burn was directed to make a fresh experiment for Government, by merely purchasing wheat at the market price, and sending it to Bombay for shipment to England, he writes on the 10th March 1846, that he "was forced to relinquish the attempt from the too "high price of grain." It being then 22 Rupees per kulsi, in consequence of a bad season (or more than 4*s*. per bushel, without all the expence of freight, insurance, &c.) The wheat sent to Liverpool having been partly damaged, was sold there at "5*s*. per bushel for the "sound, and 3*s*. 6*d*. for the unsound portion of it: the average price "of wheat in the London market, at the same period, being 6*s*. 10*d*. "per bushel." The results of this experiment were certainly discouraging, as stated in the letter of the Court of Directors (16th July 1845,) to the Governor in Council at Bombay. The Chamber of Commerce also, of that place, gave their opinion, that "the experi-"ment had turned out very unsuccessfully:" and on the 24th December, 1845, "they hardly think that, in the present state of "matters, any mercantile firm would be disposed to export wheat "to England as an experiment, since the risk of failure would be "greater than any measure of success likely to be attained would "justify it in incurring."

Wheat is also cultivated in Mysore, as described by Dr. Buchanan, and in other parts of the Madras Presidency, but I have been unable to obtain any recent information on the subject. It is extensively cultivated in some parts of Scinde, but especially in Upper Scinde, where the grain is said to be cheap, but I am unacquainted with its exact price, or the expense of conveying to Bombay.

In connection with the price, a very important consideration is the state in which wheat can be landed in England. It is well known that even from the south of Europe and from Egypt, wheat is sometimes received in a damaged state from the destructive inroads of the weevil; but it is also received in a sound condition from the greater distance and longer voyage from Taganrog and Odessa. So from India, it has often been received in so damaged a state from the inroads either of the rice weevil *(Calandra Oryzæ)* or from the granary weevil *(C. granaria)*, that it is generally considered hopeless to send it in a sound condition. Mr. Wood of the Strand Mills, Calcutta, however states, that when at Sydney, he was in the habit of receiving large quantities of wheat from Calcutta and grinding it, and has known it after a passage of 72 days, and being 4 months stowed in a godown, to be quite free from weevil or fly. I have myself received samples of wheat which have been shipped in considerable quantities, and arrived here in a sound condition. The Agricultural Society of India state—"We have, "however, proof, that wheat, *properly cured*, has lasted under much "exposure for upwards of 18 months: that it has been sent to "England, and returned to this country in good condition; and has "obtained a remunerative price, and borne a fair comparison with "British and other European produce." So in Dr. Burn's experiment it is stated,—"The grand point to decide was, can *wheat "from Bombay be landed at Liverpool in a sound state, that is, "free from weevil, or not?* and so far as is shown by the reports in "the present trial, this question has been satisfactorily answered in "the affirmative." Flour, it is well known, has been sent in considerable quantities from Calcutta to England, but this usually arrives in a sour state, when it answers admirably for sizing. The best practical rules for sending wheat, appear to be, first exposing it sufficiently that the grain may become hardened, taking care at the same time to keep it from old storehouses, or old sacks, where the weevil chiefly abounds;* having it carefully cleaned; and, I am told, that it is essential to have the grain unmixed with other varieties; also, not to ship too large a quantity in one vessel, as it is apt to heat; and also to avoid shipping in moist weather. Besides these points, it is of still greater importance to select only the best and heaviest wheats for shipment.

The most important point, however, to ascertain respecting Indian wheats, is their quality in comparison with others met with in the English market. Though several varieties are known, they seem all to be derived from *Triticum vulgare*, or common wheat. Dr. Buchanan, however, does mention *T. monococcum* and *T. spelta* as being cultivated in Mysore. The most common varieties are the *white* and *red* wheats, the flour of the first is in some places much esteemed, but in others the red wheats are considered the most nutritious. Of the varieties of wheat (about 20 in number, from different parts of India) in my possession, the finest specimens, both of white and of red wheats of India, are those sent by Col. Ouseley to the Agricultural Society of Calcutta, and which were produced in the inland districts of the Nerbudda valley. Of the five varieties sent, two were excellent specimens of their respective kinds, and may therefore be adduced as samples for comparison with other Indian wheats. No. 5 called *Pissee*, but *Doodea* in Calcutta, is a white mealy wheat, considered both in Calcutta and London to be an excellent sample of a soft white wheat, and worth at present about 90*s.* a quarter in this country. It weighed 63lbs. to the bushel, and being considered equal to the best English wheats, is no doubt the kind best suited for export to this country, the more especially as in the country where it is produced, it is considered inferior, less nutritious, and sells for only 3 Rupees for 200 seers, while another kind, the *Julalya*, sells for Rs. 4-4-0 for the same quantity. This *Julalya*, called *Gungajelly* in Calcutta, is No. 1 of Colonel Ouseley's wheats. It weighed 61lbs. to the bushel, and is an excellent specimen of a *hard* wheat, worth at present about 80 shillings the quarter, finding a ready sale, at the same time that it travels well. As a proof it may be mentioned, that the specimen, though sent by Col. Ouseley in June 1843, is still in excellent order. Of the other kinds, No. 3 or *Satya*, and No. 2 or *Kutya*, are not considered desirable for shipment, as being mixed, though both weighing 60lbs. to the bushel, and therefore likely to travel well. No. 4 or *Sohalya*, is considered too light, weighing only 57½lbs. to the bushel, that is, about the same weight as Egyptian wheat, and in other respects also most like it. The *Mooltanee* wheat in my possession, is considered a *thin* and *flinty* wheat, which would probably not be esteemed here, though it is thought highly of in Northern India. The Indian wheats partake in general of the characteristics of the *hard* wheats of warm countries, such as Sicily and the Crimea. This *hardness* is probably due to climate, but being a characteristic of those wheats which contain the largest proportion of gluten, so far from being an objection to such wheat as an article of diet, is actually its strongest recommendation, because an indication of the presence of much nutritious principle. The prejudice may therefore be expected to disappear with the increase of information. Of the Broach wheat sent by Dr. Burn, the Liverpool brokers say, it is "very similar in quality and value to what is grown in Sungrum and "Patras, and which cannot be purchased in those countries under "an average of 22*s*. per quarter." They also say, "this is used for "mixing in bread stuffs, and also for sizing purposes, the demand "for which is yearly increasing." The public will, however, become accustomed to these more glutinous wheats, as more of those of the south of Europe and of America are imported into this country, to all of which the generality of Indian wheats approach nearer than to those of Great Britain. In conclusion, it may be stated, that the opinions given by Mr. Bois, whom I consulted here, coincided with those of Mr. Haworth of Calcutta.—*Vide Trans. Agri. Soc. of India,* 1843, pp. 450 and 538.

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* The efficacy of precautionary measures must depend upon a correct knowledge of the habits of the weevil in a hot country like India. These require to be carefully studied there by a competent naturalist. See an excellent account by Mr. Curtis (Journ. Agri. Soc. of England Vol. iii, part i,) republished in Journ. of the Agri-Horticultural Soc. of India, 1846, App. pp. 148-155.

Correspondence regarding the "Pooah" fibre of Nipal and Sikim, a species of Nettle, and the "Oadal," Sterculia villosa; with a report on their qualities.

I have the pleasure to bring a new sort of hemp to the notice of the Society on behalf of Serjeant Crutcher, who is a professional worker in leather, and uses it in his craft. The Serjeant considers it equal to Russia hemp, for shoe and saddlery work, and purposes, if a demand shall arise for it, to prepare and supply it to the Calcutta market.

I shall shortly describe the plant, the method of preparing the hemp, with some other particulars, and will request of you to be so kind as to have it submitted to a comparative trial with the *sunn* and European hemps, and favor me with the result: also adding, if possible, the price it would fetch per maund in the Calcutta market.

Description of the plant.—The plant from which the hemp is made is called *Pooah* by the Parbuttias, *Kienki* by the Lepchas, and *Yenki* by the Limboos. It is like a nettle, and *is* one probably, although I cannot determine the question. I have however the pleasure to submit herewith the leaves, seeds just formed, and a portion of the stem of the plant from which the genus, if not the species, may be determined. It grows to the height of 6 or 8 feet, and varies in the thickness of the stem from the size of a quill to that of the thumb. The leaf is serrated, of a dark-green color above, silvery-white below, not hairy or stinging, and has a reddish pedicel of about 3 inches long. The seed forms in small currant-like clusters along the top of the plant, and on alternate sides about an inch apart: two small leaves spring from the stem at the centre of and above each cluster of seed.

Habitat.—The *Pooah* is not cultivated, but grows wild and abundantly in the valleys throughout the mountains of eastern Nipal and Sikim; at the foot of the hills skirting the Tarai to the elevation of 1,000 or 1200 feet, and within the mountains up to 3,000 feet. It flourishes best in the hills at the same elevation to which the cotton is grown; but it does not, so far as I can learn, grow on the flat Tarai or open plain along the mountains. It is considered a hill plant, and not suited to the plains or found in them. It does not grow in the forest, but is chiefly found in open clear places: and in some situations, overruns the abandoned fields of the hill people within the elevations which suit it. It is, I believe, a perennial; but of this I cannot speak positively, as I have not till now known the plant. It sheds its leaves in the winter, throws them out in April and May, and flowers and seeds in August and September. The exact period altering of necessity with the elevation.

When used.—It is cut down for use when the seed is formed. This is the case with the common flax in Europe. At this time the bark is most easily removed, and the produce is best. After the seed is ripe it is not fit for use, at least it is deteriorated.

How prepared.—As soon as the plant is cut, the bark or skin is removed. This is very easily done. It is then dried in the sun for a few days: when quite dry, it is boiled with wood-ashes for 4 or 5 hours; when cold, it is beaten with a mallet on a flat stone, until it becomes rather pulpy, and all the woody portion of the bark has disappeared; then it is well washed in pure spring water and spread out to dry. After exposure for a day or two to a bright sun it is ready for use. When the finest description of hemp is wanted, the stuff after being boiled and beaten, is daubed over with wet clay and spread out to dry. When thoroughly dry, the clay is rubbed and beaten out, when the hemp is ready for spinning into thread, which is done with the common distaff.

Uses.—The *Pooah* is principally used for fishing nets, for which it is admirably adapted on account of its great strength of fibre and its extraordinary power of long resisting the effects of water. It is also used for making game-bags, twine and ropes. It is considered well adapted for making cloth, but is not much used in this way. I have the pleasure to forward the following specimens in elucidation of this note.

1. Leaves of the plant.
2. Seed clusters.
3. Portions of the stem.
4. The dried bark.
5. The prepared hemp.
6. Thread.

Darjeeling : September 24th, 1847. A. CAMPBELL.

P. S.—The gigantic stinging nettle of the Nipal and Sikim Hills is made into hemp, and used in making the cloth called *Bangra,** the preparation is the same as the *Pooah.*

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* See Notes on the Agriculture of Nipal, Vol. iv. p. 173, Transactions of the Agricultural Society of India.

The *Bangra* is harder and stiffer than the *Pooah*, and not adapted to making cordage and nets.

In compliance with your request I have forwarded to your address a packet of the *Pooah* hemp, which will, I hope, enable you to have the experiment instituted as to its comparative merits. I have also sent you a parcel of the dried bark of the *Pooah*, with which you may perhaps desire to try some other mode of preparation than that in use here.

Enclosed is a note from Serjeant Crutcher on the expense of preparing the hemp, which shows that the process in his hands has been very expensive. He tells me however, that he thinks it may be prepared for about 4 Rs. per maund, if done on a large scale: this of course is still conjectural. The point to be first ascertained is, the quality of the article. On this I hope again to learn the opinion of the Society.

Darjeeling; October 30th, 1847. A. CAMPBELL.

Sir,—I beg to enclose an account of the expence incurred by me in manufacturing a small quantity of the *Pooah* for the Society.

I send per bearer the *Pooah* manufactured, also a seer in the rough state, for them to try experiments on.

The expence is, including the seer not manufactured, Rs. 4-6-6.

October 29th, 1847. C. M. CRUTCHER, *Serjeant.*

Expence of manufacturing the *Pooah*, 4½ seers only, cleaned from the stalk, cost 11 ans. per seer, ...	3	1	6
Expence of boiling the above, 2 men for two days, at 2 ans. 6 pie each per diem, also finishing the process, ...	0	10	0
Total, ... Rs.	3	11	6

Quantity manufactured from the above is two seers, at a cost as above detailed of Rs. 1-13-9 per seer: the waste in manufacture is exactly $\frac{5}{9}$ths.

The reason this experiment is costly is this—the *Pooah* was brought in by a cooly engaged on purpose, and not cultivated by myself, also the process should be conducted on a large scale, as the same expence incurred as above would be sufficient for a maund.

Extract of a letter from Major JENKINS, *dated Gowhatti, 24th November,* 1847.

The *Oodal* rope I sent you not long ago was a presentation from Capt. E. F. Smith, Commanding at Sudiya; he thought it possible serviceable ropes might be made from this substance if better prepared. You may be aware it is the common rope used by all the elephant hunters when in the jungles. The tree is very common, and the rope is made most readily, the bark, or rather all the layers, can be stripped off from the bottom to the top of the tree with the greatest facility, and fine pliable ropes may be made from the inner layers of bark, whilst the outer yield coarse ropes. The rope is very strong, and very lasting, wet doing it little injury.

Report on the above-mentioned fibre and rope. By Capt. A. THOMPSON.

An unexpected pressure of affairs has prevented me till now sending you the specimens of *Oodal* rope and *Pooah* hemp you sent me to experiment upon. I have now the pleasure of handing you the manufactured specimens, as also returning the communications of Doctor Campbell and Major

Jenkins on the subject, together with some remarks on their value and the uses to which I think them adapted.

First, the *Oodal*. When well made, this rope is equal in strength to our best coir. But in its present state (from having been made green, I suppose) it is too stiff and inflexible for marine purposes. It resisted every attempt to separate the fibre or to dress it by hackling, and could only be useful I think for rafting timbers, bale-lashings, stage ropes, and such like purposes, for which jute is now used, and the value of which is from 2½ to 3 Rupees per maund. You will see by the specimen that has been re-manufactured, that the same rope when laid by machinery is three-quarters of an inch less in circumference than that sent by Major Jenkins, consequently, a rope of 3 inches made by machinery is equal to one of 4 inches made by hand. I would further observe, that could the fibre be brought here in such a state of flexibility as to allow of its being dressed by the hackle and properly spun, the value would be very much enhanced, and I have no doubt could be made into good rope for ship use. The line made of the bark of the *Oodal*, you will observe, is much more flexible and better adapted for ship use, but not so strong. It is very elastic, having stretched 16 inches in 6 feet. It sustained 1½ cwt. for 2 hours before it broke.

Of the *Pooah* I have to report more favorably. The substance resembles cotton-wool more than hemp, consequently better adapted in my opinion for sail cloth, twine, and thread than for rope. I send a specimen of the cloth made of it, as also a piece of line. The *Pooah*, when properly dressed, is, I think, quite equal to the best Europe flax, and will produce better sail cloth than any other substance I have seen in India. I observe from Doctor Campbell's communication on this fibre, that *mud* is used in the preparation, which clogs it too much, and not only renders it difficult to dress and spin, but spoils the color, as is evident by the sample of cloth made of it. My Superintendent Mr. William Rownce, who understands the nature of these substances, tells me, that if potash was used in the preparation (which is invariably done with Russian hemp and flax) instead of clay or mud, that the color would be improved, the substance rendered easy to dress, and not liable to so much waste in manufacturing.

The value of the *Pooah* fibre here may be estimated from the following data. To make one yard of sail cloth it requires 1 ℔. 2 oz. of fibre, and the expence of dressing, spinning, and weaving it (with the rude apparatus now used by the natives), is 2 annas 6 pie, and I estimate the value of the cloth when made, at 6 to 7 annas per yard; or it may be easier understood, *thus*;—a maund of clean *Pooah* will give 72 yards, ... Rs. 25

Less expence of manufacturing, say, .. 10

Leaving as the value of the fibre, .. Rs. 15

There are other incidental expenses that are not included here, but as near as I can at present estimate, I should say, it is worth twelve Rupees per maund. I would only further observe, that if properly prepared and dressed, I think the *Pooah* capable of being converted into fibres much finer than either sail cloth or sewing twine.

Allow me also to hand you three specimens of hemp and rope made of them that I had brought from the west side of India, grown at the places named on the labels.* These have been tested both at the Arsenal and Government Dockyards, and proved perfectly equal to any and all purposes that cordage made of Russian hemp has hitherto been used for. From the encouraging reports upon this cordage from the heads of both the Naval and Military Departments, there seems no reason to doubt that this hemp and others that are being daily discovered, will completely supersede the importation of Europe made cordage.

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* Calicut, Ghote and the Concan. This hemp is no new discovery; I saw it in England, which led me to try it here.—A. T.

Having completed a manufactory for the improvement of cordage by patent machinery, and now anxious to turn my attention to the manufacture of sail cloth, twine, &c. I shall be at all times most happy to manufacture any samples that may be sent you, and which you may think worthy of a trial.

Calcutta : 31st December, 1847.

Note on various Indigo-giving Plants.

[A subscriber to the Agricultural and Horticultural Society, having indulged the writer who does himself the pleasure to address its Honorary Secretary, with the perusal of some of the late numbers of the Agricultural and Horticultural Journal, the subject of new indigoferous plants attracted his notice, and has induced him to venture the accompanying communication to the Honorary Secretary. Viewing the present condition of the Indigo trade, and indeed, its prospective welfare, it may not be deemed irrelevant to express an opinion, that the culture of other indigoferous shrubs in conjunction with the plant in use might prove advantageous to the planter, who has to struggle, not merely against a temporary reduction of price, but, it would seem, that a progressive tendency to cheapness in regard to indigo, as well as other natural productions, has become the general rule of commerce. The writer begs to subscribe himself a non-subscriber, but, well-wisher to the Agricultural and Horticultural Society.]

Mr. J. W. Masters, in his "Memoir of the natural productions of Upper Assam," Journ. p. 1, Vol. vi. adverts to *Marsdenia tinctoria*, (Brown,) or, *Asclepias tinctoria*, (Roxburgh,) as an interesting indigoferous plant.* Dr. Bancroft, in his

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* The plant is also found in the jungles of the Tenasserim Coast. See remarks by Mr. O'Riley, Journal, Vol. iii. p. 231.—Eds.

"Philosophy of permanent colors," Ed. 1813, Vol. 1, pp. 169, 189, says: "There is moreover, a plant belonging to a very different class, first mentioned as producing indigo, I believe, by Mr. Marsden in his History of Sumatra, p. 78, under the name of *Taroom akkar*. He describes it "as a vine, or creeping plant, with leaves 4 or 5 inches long; in shape like those of a laurel, but finer, and of a dark-green color," and that, "by reason of the largeness of the foliage, it yields a greater proportion of sediment. The *Taroom* is always found in the plantations of the natives, but to dye with it, they leave the stalks and branches for some days in water to soak, then boil it, and with their hands work some chunam among it, with the leaves of the *Pacoo sabba*, (a species of fern,) for fixing the color. They then drain it off, and use it in a liquid state." This plant, *(Taroom)* Dr. Roxburgh considers as a species of *Asclepias*, or *Swallow-wort*, and has added to it the trivial or specific name of '*tinctoria*.' It was brought from Sumatra, and widely distributed in Bengal about the year 1791: is perennial, and is easily propagated by layers, slips, or cuttings.—*Note*. Dr. Roxburgh has favored me with three samples of indigo which he obtained from the *Asclepias tinctoria*, by hot water: one is a very fine violet-colored indigo; another is more inclined to blue, and the third to purple; the two last were specifically a little heavier than the first." Further, p. 274—276, "my belief (is) that the *Baraset verte*, (or green indigo) of Mr. Birch, was obtained from the *Taroom akkar* of Mr. Marsden, the *Asclepias tinctoria* of Dr. Roxburgh, (who) describes another species of *Swallow-wort* under the name of *Asclepias tingens*, which is, he says, "a large, twining, shrubby plant, brought from Pegu in 1795, to the Botanic Garden at Calcutta, where it thrives well. Dr. Buchanan, who brought the plant, informed me, that from its leaves the Burmah people prepare a green dye. I have made (Dr. R. adds,) a variety of experiments, with the view of obtaining the green dye above-mentioned, but without success."—See Trans. of the Society of Arts. 28, p. 305."

With regard to the latter plant, it is scarcely presumable that we are ignorant, at the present day, of any simple, vegetable green dye, known to the Burmese. May not the *Asclepias tingens,* Roxb., afford a yellow for the formation of green, in the way described by Major Hannay, Journ. p. 1. Vol. vi. in his "Note on the dye-stuffs of Upper Assam," where, preparations of two plants, named *Mishmee teeta* and *Khae khew*, are severally superadded to blue for that purpose? Bancroft, however, Vol. 1. pp. 190, 264, says: "Professor Thomas Martyn, mentions on the respectable authority of Loureiro, that the *Spilanthus tinctoria* is cultivated in China and Cochin China; that the leaves bruised yield a most excellent blue color, and a green prepared by a method more easy than from indigo, and not inferior in brightness." Loureiro mentions (tom. 1, p. 25 of the original Lisbon ed.) the *Justicia tinctoria* as growing wild in Cochin China, adding, '*folia viridi colore saturata, eodem telas pulchrè imbuunt.*'

While on the subject I beg to mention, (as it may not be generally known,) that the *pukkah* wood of the jack fruit tree *(Artocarpus integrifolia,)* yields a yellow color: a few experiments on which wood lead me to believe, that if brought into use, it would stand high in the list of yellow dye stuffs. It appears to be rich in coloring matter; affording also much of that "lively greenish or lemon hue, for which the Weld yellows are particularly valued," according to Bancroft. A decoction of the jack wood requires no mordant to fix a common yellow on wool.

November 15*th,* 1847.

Remarks on the propagation of Plants by Leaves. Communicated by H. Rehling, *Esq.*

My attention having been drawn by Mr. Cheek's notice on the propagation of plants by leaves, and an extract from the Gardener's Chronicle for 1845, published in the Society's Journal, Vol. v. part iv., I beg to submit the following remarks of what I have perused from several German and Danish writers on this interesting subject.

Many have heard, and noticed the circumstance of propagating plants and trees by leaves, but it appears very few are aware of the real facts of the case. An intelligent gardener in Germany, by name Heinrich, was, if I am not mistaken, the first person who made the experiment; but Mr. Mirandola* is the first person who has written on the subject, and all that Mr. Hohberg, and latterly Mr. Thümming and other writers have written on the same subject, is entirely borrowed from the above authority. To the great German agriculturist and economist, Von Mürchousen, is undoubtedly the whole credit due, of having been the person who has set this question at rest, and furnished us with real proofs with regard to this interesting subject. His grandfather planted in the year 1714 a leaf of a lemon tree (Limon à Revo), and observed that it had during the same summer struck roots, but without forming any buds; the ensuing spring he removed it into another pot, only allowing the roots to be covered up by the soil; very soon a bud was formed, but the stem was checked in its growth by the formation of a flower-bud, which the same season produced a fruit of a pretty good size. The grandson Otto Von Mürchousen, and his worthy Secretary Mr. Jakaby, have since succeeded in rearing a number of trees on the same plan, which attained the height of 8 feet; and who, by a number of experiments discovered, that without exception, they failed in producing buds on other leaves than those of a lemon tree, and that only by paying attention to the following precautions in chosing the leaf; the leaf must be the produce of the same spring, and be healthy and full grown when detached from the branch, and particular attention must be paid that not the least sign to an eye or bud is perceptible at the angle formed by the stalk of the leaf and the branch, in which case the leaf is perfectly useless for propagation. If a leaf of the above description is obtained, it is put into a flower pot, and a slow heat and a continual and even moisture supported. When due attention is paid to the above, you may be sure of success.*

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* The same authority is quoted in the extract from the Gardener's Chronicle for 1845, published in the Society's Journal, Vol. v. part iv. There is evidently a mistake in the extract, which calls him "Maudirola."

Mr. Esaias Fecisher, an eminent Danish naturalist, and who has written a good deal on the physiology of plants, has endeavoured to settle this question, and explain the cause that produces such irregular effects in a leaf. I will, as near as possible, give his own words: "Let us particular-"ly notice and examine into the mechanism and functions of "the leaves, and the work they are intended to perform, "namely, to absorb, digest, and prepare food to support "other parts of the plant. It is a well known fact, that "trees generally put forth two shoots during the season; "when the first shoot has been produced by the agency of

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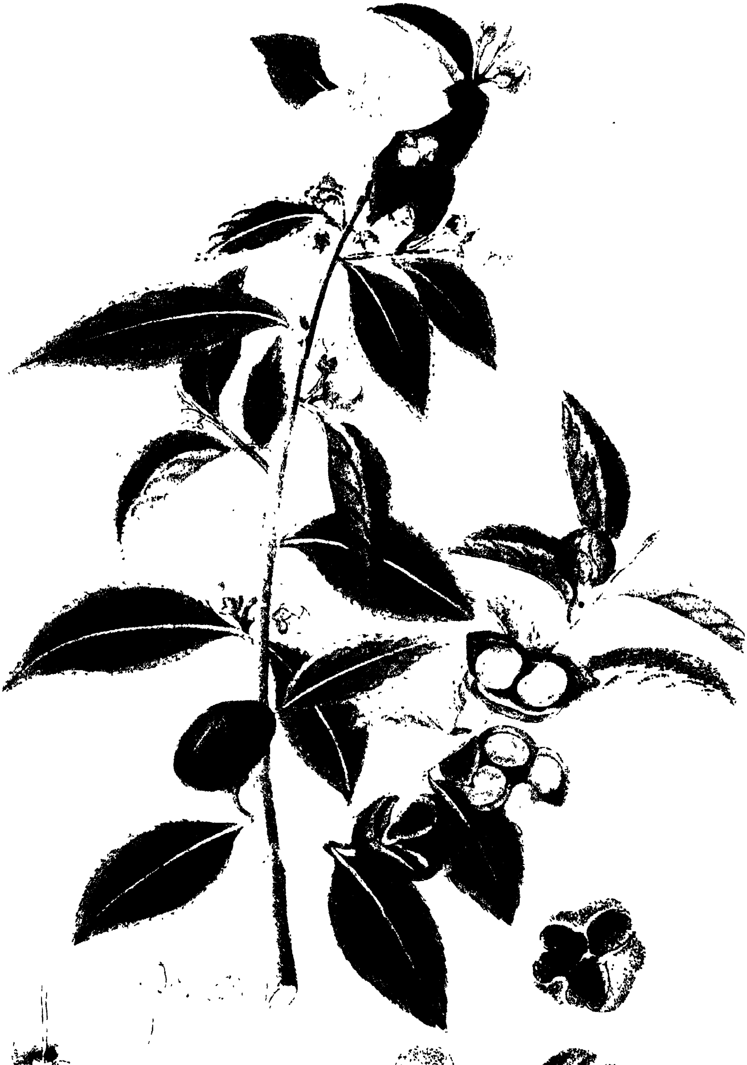
* Agricola has noticed the successful experiments made by Von Murchousen in his " Virsuch der Universal, Virsuchoung aller Baume, &c." but he has sadly prejudiced the cause he has adopted by the publication of some plates illustrative of the subject, and his statements abound in improbabilities.

"the organizable matter, prepared and reserved from the "previous year, the preparation of fresh organizable matter "for the production of the second shoot takes place. We "must here particularly notice the circumstance, that no eye "or bud is to be found on a lemon tree about this time, and "the organizable matter is consequently reserved in the leaf "itself, as if in store, till the supply is sufficient to form "cellular matter for the production of buds, which at once "burst out into leaves and branches. It is then evident, "that the cause is to be traced to the circumstance, that "the leaf contains in itself the necessary organizable matter "that engenders cellular substance for the production of "buds and leaves, without the agency of the other parts of "the tree, which, in other trees than that of a lemon tree, "*is gradually* supplied from the leaves, for the formation of "buds, and they do not therefore contain the necessary organizable matter, for, as soon as a bud is formed, the "leaf is exhausted, and has not the power to produce another "bud."

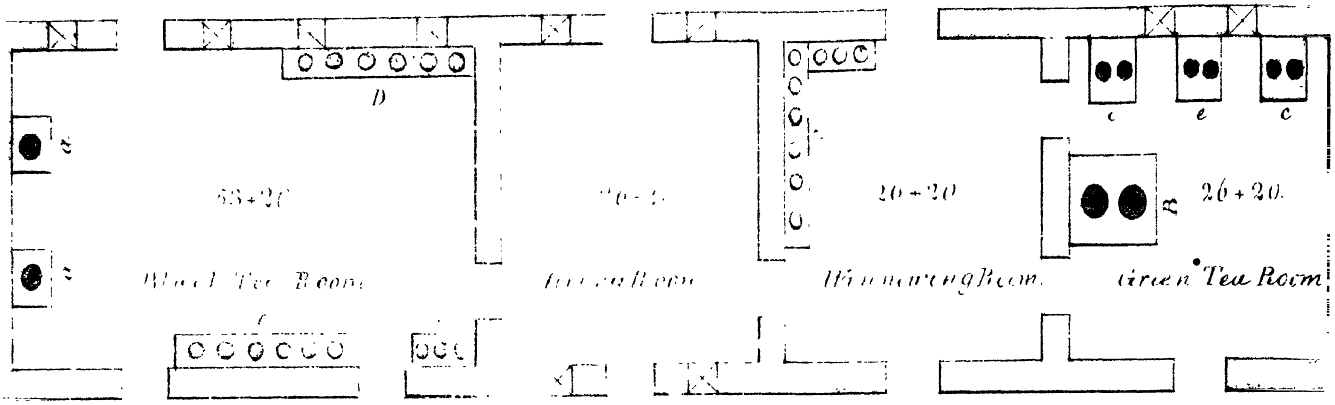
On perusing the above remarks, the idea suggested itself to me whether leaves of other trees could not be prepared for the purpose of propagation, by adopting some means to prevent the eye or bud making its appearance, which, I should say, can easily be effected by operating upon the leaf and branch to which the leaf is attached, by which process the petiole of the leaf is charged with the necessary organizable fluids, and contains within itself, as the germ in a seed, the matter that ultimately produces a bud. Is it not probable, that this circumstance will account for some persons having succeeded in forming buds on leaves, while others, with all the attention and perseverance they have bestowed upon it, have failed in doing? Is there not some likelihood, that in those instances which have been attended with success, the leaves selected have been deformed or injured by insects or other causes, in the first stage of their formation and growth? I am about making some experiments, and shall not fail to report the result to you. I think the subject well worthy the attention of parties who have more leisure and opportunity in making such experiments.

August 25th, 1847.



Nº 2. *Thea bohea*

No. 4. Plan of Government Tea Manufactory. Hawalbaugh.



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No. 5. Tea Manufacturing Implements.

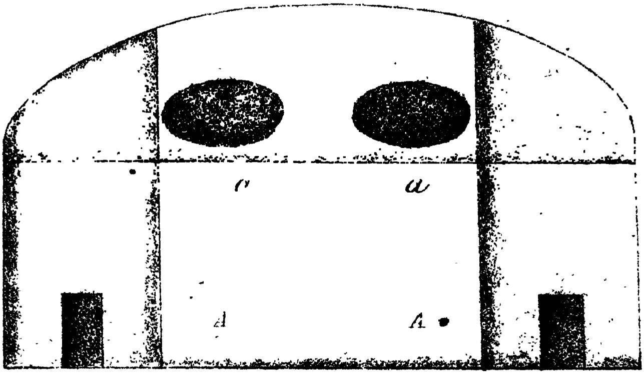
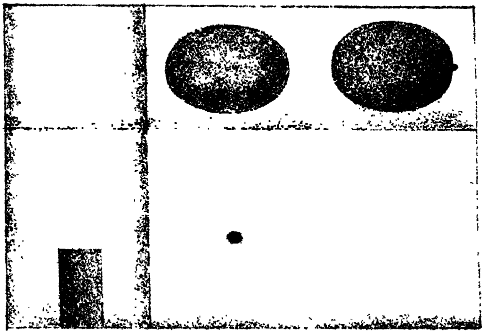


Fig. 14



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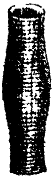
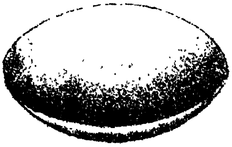


Fig. 13



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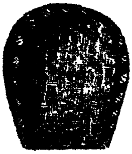


Fig. 6

T. Black, Asstt. Lith. Press Calcutta.

No. 6. Tea Manufacturing implements

Fig: 15

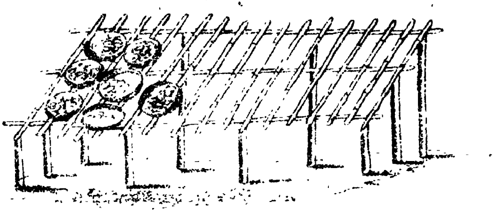
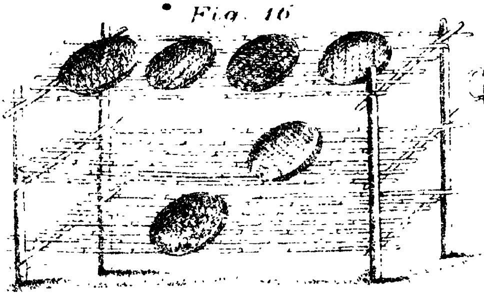


Fig. 16



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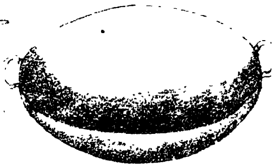

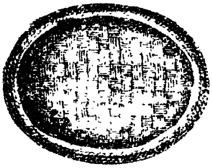

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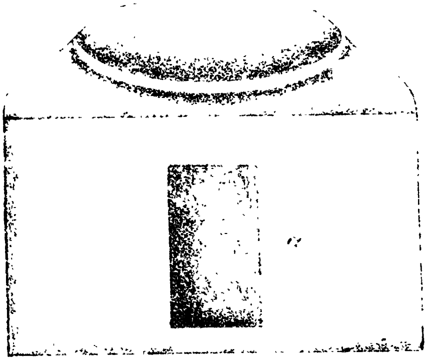
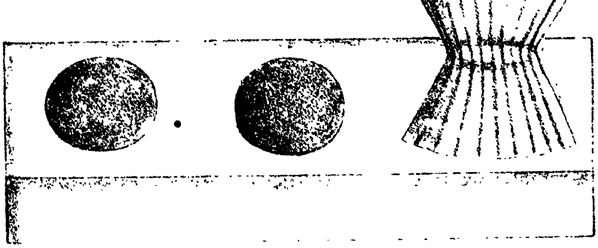
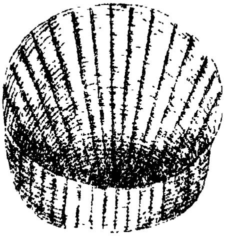


Fig. 7



Nº 7. Tea Manufacturing implements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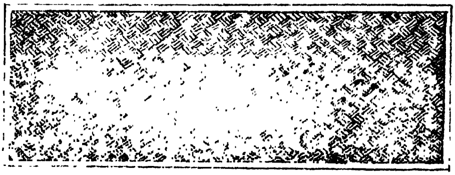
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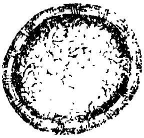
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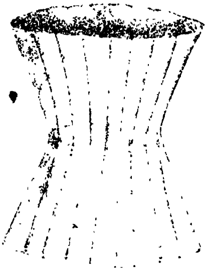
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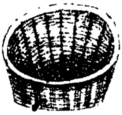
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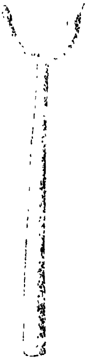
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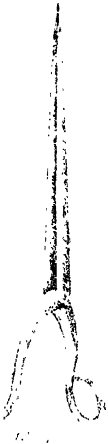
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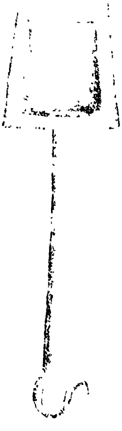
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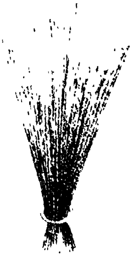
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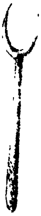
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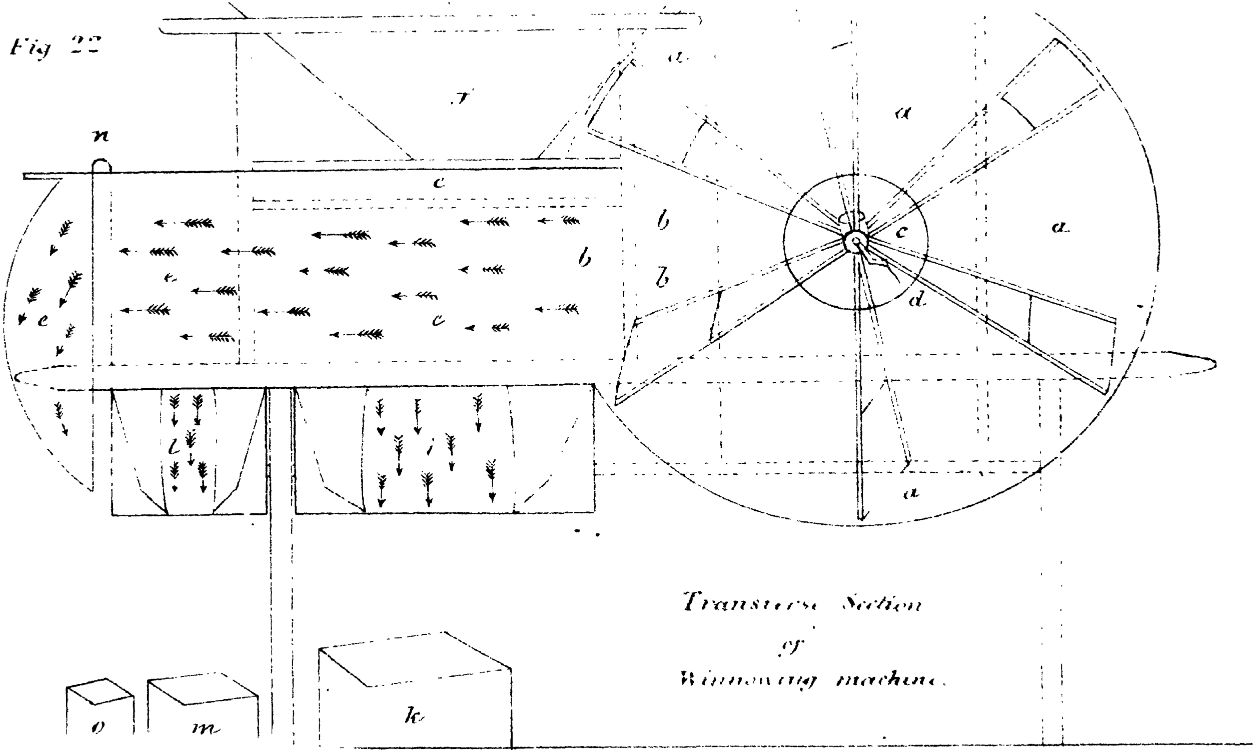
Fig 22



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Shawe, M. Esq. Civil service, Backergunge.
Shib Chunder Deb, Baboo, Deputy Collector, Midnapore.
Showers, Major St. Geo. D. (72nd Regiment N. I.)
Sinclair, George, Esq. Dinapore.
Skipwith, F. Esq. Civil service, Chittagong.
Sleeman, Lieut.-Colonel William Henry, (1st Regiment N. I.) Agent to Governor General, Saugor and Nerbudda Territories.
Small, James, Esq. Calcutta.
Smith, Samuel, Esq. Proprietor of the Hurkaru Newspaper, Calcutta.

Smith, George Henry, Esq. Civil service, Delhi.
Smith,† Francis Curwen, Esq. Civil service.
Smith,† Robert, Esq. Merchant.
Smith, Adam Freer, Esq. Merchant, Calcutta.
Smith, Sydney George, Esq. Civil service, Banda.
Smith, Capt. R. Artillery, Calcutta.
Speede, G. T. Frederick, Esq. Calcutta, (Free Member.)
Spier,† William, Esq. Merchant.
Spiers,† Captain William.
Sreekissen Sing, Baboo, Calcutta.
Sreekissen Mullick, Baboo, Calcutta.
Stacy, Colonel Lewis Robert, C.B. (43rd Regiment N. I.) Commanding at Neemuch.
Stainforth,† F. Esq. Civil service.
Stalkart, William, Esq. Merchant, Calcutta.
Staples, Lieut. N. A. Artillery, Dum-Dum.
Staunton, M. S. Esq. Assistant Military Auditor General's Office, Calcutta.
Steel, Major James, (2nd European Regiment) Agra.
Stephenson, R. M. Esq. Calcutta.
Stevenson,*† William, Esq. Junior, M.D.
Stewart,* Captain William M. (22nd Regiment N. I.) Fort Adjutant, Chunar.
Storm, William, Esq. Merchant, Calcutta, (Vice-President.)
Storm, John, Esq. Merchant, Calcutta.
Stopford,† James Sydney, Esq. Merchant.
Stokes, Lieutenant S. W. (Horse Artillery,) Meerut.
Stowell, C. S. Esq. Merchant, Agra.
Strickland,† R. S. Esq.
Strong, F. P. Esq. Medical service, Calcutta.
Stuart, James, Esq. Merchant, Calcutta.
Sturgis,† Henry P. Esq. American Consul, Manilla.
Sturt, R. R. Esq. Civil service.
Sutherland, Colonel J. Superintendent of Rajpootanah.
Sutherland, Patrick, Esq. Assistant Military Board Office, Calcutta.
Sutherland, Charles J. Esq. Merchant, Moulmein.
Sutherland, Thos. Esq. Merchant, Calcutta.
Sutt Churn Ghosaul, Rajah, Calcutta, (Vice-President.)
Syme,† Andrew, Esq. Merchant.
Swatman, Captain William, (65th Regiment N. I.) Assistant Commissary General, Dacca.
Swetenham, H. Esq. Civil service, Dacca.
Swinhoe, T. B. Esq. Attorney, Calcutta.

Talib Ally Khan, Zemindar, Gyah.
Tarrucknauth Roy Bahadoor, Baboo, Principal Sudder Aumeen, Maunbhoom.
Taylor, C. B. Esq. Supt. of the Palamow Collieries, Rajharra.

Taylor, George, Esq. Barrister at Law, Calcutta.
Teil, John, Esq. Tanner, Kidderpore.
Terry, W. Esq. Indigo planter, Midnapore.
Thomason, The Honorable James, Lieutenant Governor of the N. W. Provinces, Agra.
Thomson, R. Scott, Esq. Surgeon, Calcutta.
Thompson, J. V. Esq. M.D., F.L.S., Deputy Inspector General of Hospitals, Sydney, (Corresponding Member.)
Thornton, John, Esq. Civil service, Agra.
Thurburn, R. V. Esq. Indigo planter.
Tickell, Captain S. R. (31st Regiment N. I.) Assistant to Commissioner of Arracan.
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Tiery, L. Esq. Berhampore.
Todd,† James, Esq.
Tonnochy, Thomas, Esq Deputy Collector, Bolundshohur.
Torrens, Henry, Esq. Civil service, Berhampore.
Torrens, Robert, Esq. Civil service, Calcutta.
Tranter, Geo. Esq. Medical service, Meheedpore
Trevor, Edward Tayler, Esq. Civil service, Kishnaghur.
Trotter,† John, Esq. Civil service.
Trotter, T. C. Esq. Civil service, Tirhoot.
Tucker, Charles, Esq. Civil service, Calcutta.
Tucker, Henry Carre, Esq. Civil service, Goruckpore.
Tulloh, C. R. Esq. Civil service, Jaunpore.
Turner,* Thomas Jacob, Esq. Civil service.
Turner, George, Esq. Medical service, Mirzapore.
Turner, Alfred, Esq. Merchant, Calcutta.
Turton, Sir Thomas E. M. Bart. Ecclesiastical Registrar, Supreme Court, Calcutta.
Tweedie,† John Esq. Indigo planter.
Twemlow, Major George, Nizam's Army, Aurungabad.
Tynan, John, Esq. Superintendent of Salt Chokies, Jessore.

Vansittart, H. Esq. Civil service, Lahore.
Vaux, G. B. Esq. Calcutta.
Vetch, Capt. Hamilton, Asst. to Commissioner of Assam, Debroghur.
Vincent, W. Esq. Indigo planter, Cawnpore.
Vizianagram, Meerza Rajah Vizearam Guzputty Rauze Bahadoor, Rajah of.
Vos, J. M. Esq. Architect, Calcutta.

Waghorn,† Thomas, Esq. (Honorary Member.)
Wallace, A. Esq. Merchant, Calcutta.
Wallich,† N. Esq. M.D. (Honorary Member.)
Walters,*† Henry, Esq.
Warner,† Edward Lee, Esq.

Watkins, Thos. Esq. Katsooly, viâ Munglepore.
Watson,† Major General Sir James, K.C.B.
Watson,† John, Esq. Indigo planter.
Watson,* Robert, Esq. Indigo planter, Calcutta.
Watt, Robert, Esq. Indigo planter, Tipperah.
Waugh, Captain A. S. Surveyor General of India, Allahabad.
Wemyss, Capt. W. B. 9th Cavalry, Brigade Major, Meerut.
Wemyss,† Captain James.
Wight,* Robert, Esq. M.D. Madras Medical service, Superintendent Government Cotton plantations, Coimbatore.
Williams, Fleetwood, Esq. Civil service, Budaon.
Willis, Joseph, Esq. Merchant, Calcutta.
Wilson, A. G. Esq. Deputy Magistrate, Gyah.
Wingrove, E. Esq. Merchant, Calcutta.
Wise, J. P. Esq. Indigo planter, Dacca.
Wodehouse, the Honorable W. E. Ceylon Civil service, Columbo
Woodcock, T. Parry, Esq. Civil service, Allahabad.
oodcock, E. E. Esq. Civil service.
odcock, Lieutenant S. C. (Horse Artillery,) Meerut.
Wood, George, Esq. alcutta.
W ay, L. Esq. Penang.
att, Thomas, Esq. Civil service, Rungpore.
W ie Macleod, Esq. Barrister, Supreme Court, Calcutta.

Young, G. I. Esq. Indigo planter, Rungpore.
Young, J. H. Esq. Civil service, Calcutta.
Young, Lieut. James, Artillery, Futtehpore.
Young,† A. R. Civil service.
ule, J. Esq. Indigo planter, Tirhoot.

THE JOURNAL

Agricultural & Horticultural Society

INDIA.

Memorandum descriptive of several kinds of Cotton introduced into the Agra district. By H. HAMILTON BELL, *Esq., Agent Cotton Experiments in the N. W. Provinces.*

[Communicated by the Government of India.]

FOR transmitting a list of the various descriptions of cotton now in cultivation, under sanction and instructions of the Government, it may not be thought irrelevant or misplaced to accompany this with some short account of each separate kind, as explanatory of the mode of proceeding adopted, showing its results, and thus perhaps leading to suggestions that may render our future progress greater and more decidedly beneficial.

I have already in former papers noticed my decided preference for indigenous seed as the basis at least of all my arrangements, and besides the kinds of which musters were sent home in the early part of the year, the report on which is not unfavorable, and of which subsequent shipments were composed, have met with some other descriptions, which I think deserving of attention. Amongst these are—

1. *Sophur.*—Of which the seed was obtained from a place so named on the confines of the Gwalior territory, near to Kolah. I accidentally heard it mentioned as superior, and immediately sent off a servant in whom I could confide, to bring me a bullock-load of the *kupas*, that I might learn whether the cotton merited its reputation, and to be sure of the seed as extracted by my own servants. In my opinion, it is superior to the *Baychenee,* and it is in every other respect perfectly suited for cultivation in these provinces. It is perfectly hardy, comes quickly to maturity, and is fully as productive: it has attracted greatly the attention of the cultivators, and its introduction into these provinces will be facile and general. In several very carefully conducted experiments, I have ascertained that the *kupas* yields the very large proportion of 35½ per cent. of clean cotton. Our cultivation is on too small a scale to justify any statement of average production, but at all events, it is in this respect fully equal or rather superior to the *desee* cotton of the Doab. This year we shall have some bales of this quality for shipment, and plenty next year.

2. *Hybrid,* I conjecture, of *Baychenee* and *Chundehree* cotton. I have not myself any doubt on this point. I know nothing of botany, and to accident, not science, am indebted for this description. I think very well of it. It has all the good qualities of the *Sophur* as to hardiness and production, and almost equals it in the relative proportion of cotton and seed. The cleaned cotton being 34¼ per cent. of the *kupas.*

3. *Produce of Coimbatore seed.*—Remarking in the newspapers that some cotton from thence had been sold at 7*d.* per ℔ in England, I obtained through a kind friend at Madras some of the seed. From the appearance of the plant I should consider it "New Orleans," but there is a marked

difference in the shape of the seed. It will hardly succeed in these districts; and although I think I may have influence enough to induce a variety of trials the ensuing season, I cannot hope it will answer, from the degree of irrigation it demands, its comparative limited produce, and the diminished relative proportion of cotton in the *kupas:* the mean of several trials varying but little, being only 25¾ per cent. Its fineness, and I think staple, are however, so attractive, that I will not give it up until I am satisfied success with it is hopeless.

4. *Hybrid of Bombay and Baychenee.*—This very closely resembles the presumed hybrid noticed as No. 2, and the only reason I have for believing that there must be a difference is, that the flower in the former is white and in the latter yellow. I do not know whether this is botanically conclusive of a difference of species;—and in other respects, as regards production, proportion of cotton to seed, &c., they agree. I should add, that I believe I may say in every cotton-field of my own cultivation, there are some plants which are white in the color of their flower, and that the cotton invariably from these plants, so far as my observation goes, is superior to the perfectly similar plants contiguous with a yellow blossom. I propose to extend the cultivation of this description as much as practicable.

5. *Bombay.*—I describe this under this name: the seed reaching me by dâk, the address being in the hand-writing of a gentleman then residing at that place, but it has almost perfect resemblance to the *Chundehree* cotton. It is fine, but it will never answer here, from the extreme tardiness of its arrival at maturity; and although the plant is exuberantly productive of cotton bolls, these are small, and the relative proportion of cotton and seed are discouraging; the former giving in my trials only 25 per cent. of the *kupas.*

6. Of all I have introduced, this, the Jeypore, has attracted most regard. It is by far the most productive; the plants

being large, and covered with bolls larger a good deal than the *Sophur* or *Baychenee,* and double those of the *desee* cotton. The cotton seems to have a longer staple than the other descriptions; but it appears to be almost as harsh to the feel as the *desee.* In this field there are a good many plants with a white flower, the general color being yellow, and these are decidedly the best cotton. I have about two maunds of the *kupas* of the white-flowered Jeypore, and I hope for two more, which will give me seed for 150 beegahs next season. The mean relation of cotton to *kupas* is 38¾ per cent., but some trials gave me above 40 per cent. Of this I send a sample, that my opinion of its preferable quality may be tested in the home market. I am indebted to Major Ludlow, Resident at Jeypore, for the seed of this cotton, which I regard as of the highest promise.

7. Although a variety of villages cultivate the *Baychenee* cotton, thus named I fancy from the chief village in that part of the pergunnah where it is grown, the produce of Nundpore, Bindwas, Debee, and Deogun, has the highest reputation. This probably arises from the deep black soil there prevailing, but it is partially attributed to the careful selection of seed for cultivation. The women in seeding the cotton by the *churka,* are accustomed, whenever a large boll comes into their hand, to throw it aside into a basket placed for the purpose, and the same process is pursued when the basket's contents are freed from the seed. In this way the very finest bolls produce the seed, and they thus account for their superior cotton. That it is superior, is undeniable, for struck by the remarks, I sent at some expence a man to Nundpore to get some seed, and used it in my own cultivation. The produce is undoubtedly better than our other *Baychenee,* which is fully equal to the general Gwalior description, so named, and its ratio of cotton to *kupas* is remarkable, being no less on my trials than 38 per cent. The produce even this year will be of sufficient quan-

tity to admit of being packed separately, and by that means we can obtain its accurate estimation in England. I have taken measures for a supply of seed for next year's cultivation from the villages in question, and from my own cultivation I can reckon on sufficient for some thousand beegahs.

8. This cotton, which I term *Omurgurh,* originally was the produce of a few plants in a *Khet,* sown with the *Chundehree* cotton. The shape of the leaf and general appearance of the plant led me to desire its being separately picked, and the seed set aside for the ensuing year, whilst the produce of the *Chundehree* seed generally came so late to maturity as to be continually exposed to frost, and was also otherwise unsuitable: this flowered early, and was fairly productive and fine, and fully justified the trouble taken with it. The natives will now readily use the seed in their sowings. The cotton is 33⅓ per cent. of the *kupas.*

9. Seed of white flower. Jeypore cotton.

10. I trust it will be considerd that these musters establish some progress, and although I fear it will take more time than I had anticipated to give us a fair prospect of success in a struggle partially for the home market, I see nothing to discourage the expectation that ultimately we shall effect such an improvement in the cotton of this country, as will render it suited for many of the manufactures of Great Britain. I do not look much further than this just now, let us once secure a certain regular market at some price, let us get our cotton into use, and the rest will follow.

Correspondence regarding the cultivation of Wheat in India, and the practicability of exporting it to the English Market.

[Communicated by the Government, North-Western Provinces.]

To R. MONTGOMERY, *Esq.*, *Collector of Cawnpore.*

SIR,—In compliance with your request, I beg to submit the result of my inquiries with reference to the memorandum of the Agra Revenue Department, transmitting to you copy of a despatch from the Honorable the Court of Directors regarding Dr. Royle's observations on the cultivation of wheat in India, and calling for information on the subject.

2nd. From the second paragraph of the Honorable the Court of Directors' despatch it would appear, that information is required on the following points, viz.:—

1. The quantity of wheat cultivated in the district.
2. Quality and varieties of the grain.
3. The ordinary bazar prices.
4. Cost of conveyance to Calcutta.
5. And generally on any points which may assist the Court of Directors in forming an opinion as to the possibility of making wheat an ordinary article of export from India to England, with reference to the usual average prices prevailing in England for that description of grain.

3rd. With reference to the first point I beg to remark, that from investigations which I made myself, while out in the district on circuit, in the years 1844 and 1845, and subsequent enquiries, I am of opinion, that the quantity of wheat cultivated in the district cannot be less than 161,461 acres, or Jurreebee beegahs 355,214, yielding at the average of $17\frac{3}{5}$ bushels per acre, 101,490 tons, or maunds 28,41,712, at the average produce of 8 maunds per Jurreebee beegah.

4th. In reply to the second query I have to state, that there are three varieties principally of the wheat cultivated in this district, namely, two species of the white or *Triticum sativum,* called here the *Pissee* and *Doodeea,* the one bearded, and the other awnless. The third, the red kind, or *Triticum aristatum,* called here the *Gujjur,* is cultivated about the banks of the river Ganges, and *nuddies* subject to inundation during the periodical rains. The white wheats, on the contrary, are grown on the level plains or table-lands of the district.

5th. With respect to query the third I have to observe, that in an average season the white wheats generally sell here from 30 to 32 seers, (60 to 64lbs.) per rupee (2 shillings), and the red from 33 to 35 seers (66 to 70lbs.) per rupee.

6th. In reply to query fourth I have to state, that the expence to Calcutta does not exceed 8 annas (1 shilling) a maund or bushel, equal to four rupees (8 shillings) per quarter, consisting of 8 bushels, or 8 maunds.

7th. I shall now proceed to offer a few general remarks with respect to the concluding number of the Honorable the Court of Directors' despatch.

8th. There are other varieties of the red wheat, which are produced on the banks of the Ganges and *nuddies,* and brought here by water for sale from Anoopshire, in zillah Coel, and villages in Rohilcund and Shahjehanpore, situated on the banks of the Ganges.

9th. The *Pissee* and *Doodeea* are consumed by the better classes of natives, and used by the bakers for the manufacture of loaf-bread; the red is used by the middling classes of the people of the district.

10th. The white wheat purchased here at harvest time at 30 and 32 seers per rupee, would cost when landed in Calcutta about 1 rupee and 12 annas per maund, and in England about 35 shillings per quarter. In the 7th para. of page 6 of the report, which accompanied the despatch of the Honorable the Court of Directors, it is mentioned that the freight and other charges from Calcutta to England amounted to 25 per cent., but through mistake, it will be perceived the whole 25 per cent. has been added to the cost of one quarter, or eight baskets, instead of 7 shillings the proportion chargeable upon the quarter. This error made the price of the wheat when landed in England amount to 53 instead of 35 shillings per quarter. From enquiries which I have made of the wholesale dealers, I find that from twenty to thirty thousand maunds of the white and red kinds of wheat, may, without difficulty, be purchased here about harvest time at the averages mentioned in my reply to the third query.

11th. The Patna and Monghier white wheats, which were very largely sent to Calcutta for export to England, are however, selling at the present moment in the Calcutta market so cheap, (about a rupee a maund,) owing to the unfortunate prevailing commercial pressure and disasters, that I am of opinion nothing could be advantageously done here until the present panic wholly subsides.

12th. I have the pleasure to submit musters of the several kinds of wheat which I procured here from wholesale dealers in the article about a month ago, with the prices affixed which each sort then bore in the market. Since that period the prices have risen somewhat, owing to the great concourse of people and cattle belonging to the King of Oude which remained encamped opposite to Cawnpore for about a fortnight. The consumption of grain of all kinds during that period was so large, that the whole of what was usually stored for the year's consumption of the inhabitants for miles and miles around, on the opposite banks of the Ganges, was used by the King of Oude's followers and cattle. In consequence, a temporary rise has taken place in the prices of grain, and a good deal of what is imported here by water from above is carried across into the Oude territories, to supply the deficiency thus occasioned.

13th. In page 9 of the report it is stated—"the grand point to decide was, can wheat be landed at Liverpool in a sound state, that is, free from weevil, or not?" I am of opinion it may, by dipping the gunny bags which are to be used for the packing of it, into a solution of nitre, plunging them afterwards in cold water, and allowing the bags to dry properly before the grain is put in them. This process would cost little, as the saltpetre used could be again almost wholly extracted by simply boiling the saturated water and crystalization. It would be worth while trying the experiment, particularly as the expence would be trifling compared with the object in view.

I have, &c.,
(Signed) J. G. BRUCE,
Deputy Collector.

CAWNPORE:
The 20th Dec. 1847.

To the Sudder Board of Revenue, N. W. Provinces, Agra.

GENTLEMEN,—I have the honor to submit for the perusal of the Board a letter and its enclosures, No. 56, dated 12th instant from the Collector of Goruckpore, on the subject of the wheat grown in that district.

2nd. Mr. Cook is a practical agriculturist, who manages a grant on the western side of the district. Mr. Nicholson is a Sub-Deputy Opium Agent, who exercises his vocation on the eastern side.

3rd. The instructions of the Court of Directors referred to by the Collector have not been received in this office.

4th. Mr. Cook's suggestions for packing of wheat in shipments, with the same precautions as are observed by the natives of the country in storing it, are, I doubt not, judicious. But I am inclined to concur with Mr. Nicholson, that the weevil is the real obstacle to successful exportation, Attempts have more than once been made, but they were total failures.

I have the honor to be, &c.,
(Signed) E. A. READE, *Commissioner.*

To E. A. Reade, Esq., *Commissioner of 5th Division.*

Sir,—With reference to the Court of Directors' instructions, dated London, the 17th July last, I have the honor to transmit for your information copies of memorandums by Messrs. Cooke and Nicholson of this district, on the subject of wheat.

I have, &c.,
(Signed) H. Carre Tucker, *Collector.*

The 12th February, 1848.

To H. C. Tucker, Esq., *Collector of Goruckpore.*

Sir,—I have received your Circular regarding wheat, and if the following remarks will prove acceptable, I shall be fully repaid for the time I have devoted to the subject.

In this part of Goruckpore (west), to my knowledge there are seven kinds of wheat grown, viz.:—

1st. *Tameeah.*—This does not grow tall: is a small grown, and is copper colored, hence its name: is very glutinous and is easily ground into flour, which is soft: is sown and grown in high lands: the return per acre in grain amounts to, in a fair returning season, 12 maunds Goruckpore weight, or 20 per cent. more by the Calcutta bazar standard, or 576 seers, equal to or a little better than 1,152℔s., which at 60℔s. to the bushel equals about 20 bushels per acre.

2nd. *Gungajullee.*—Grows taller than the preceding kind, the grain likewise is larger: color whitish: takes its name from the clearness or whiteness of the water of the Ganges: not so glutinous as No. 1: is easily ground into flour: has a small proportion of husk or bran: flour soft: is sown and grown in *Dorus* soils, i. e. neither light nor heavy: the return per acre in grain exceeds slightly No. 1, or say Goruckpore maunds 13-8-0, or 20 per cent. more by the Calcutta bazar standard, or about 21 bushels per acre.

3rd. *Setwa.*—Grows tall: grain larger than No. 2: color darker, likewise grows in low, heavy and moist lands, is a hard grain: less glutinous than Nos. 1 and 2: crop not easily destroyed by wet or damp weather: has a greater proportion of husk than No. 2: flour hard: the return per acre in grain exceeds the two former kinds, or say Goruckpore maunds 14-16-0, or 20 per cent. more by Calcutta bazar standard, or 23 bushels per acre.

4th. *Mooriliva.*—Grows better than all others: color darkish: grows in heavy soils: a large grain and hard: glutinous, husky, flour hard: ripens later than all other wheats: has no awn or beard, whence its name Mooriliva, i. e. shaven: returns per acre Goruckpore maunds 14-16-0, or bushels 23 per acre.

5th. *Daoodee.*—Grows tall: color white: grows in *Dorus* soil; large grain: mealy: more glutinous than Nos. 3 and 4: not very husky: flour soft: is called after King David of old: returns per acre Goruckpore maunds 14-16-0, or 23 bushels.

6th. *Lalleeah.*—Grows tall: color reddish: hence its name: grows in *Dorus* soils: is preferred to all other sorts by agriculturists: has not much husk or bran: soft, very glutinous and sweet: returns per acre Goruckpore maunds 14-16-0, or 23 bushels.

7th. *Samodiva.*—Grows tall: color whitish: grows in low or *muttiar* lands: grain large and hard, not so glutinous as No. 6: rather husky: flour hard: returns per acre Goruckpore maunds 14-16-0, or 23 bushels.

The seed required to sow an acre of land with wheat is about 1½ maund, or 72 seers Calcutta weight, or 5 qrs. 7℔. 12oz. It is a winter crop: is sown about the latter end of October or beginning of November, and requires two waterings to bring it to maturity, unless there is a fall or two of rain. Wheat is likewise very generally sown on the sloping banks of rivers: after the subsiding of the waters on such lands it requires no irrigation, and the returns are larger. The lands used for wheat are highly cultivated and pulverized, and are generally fallowed before a crop is put into them:

the same lands do not have a wheat crop two years running, but have a change.

In case, however, of the periodical rains continuing to a late period, much of the lands which have already produced a rice crop are sown likewise with wheat; wheat is reaped in March. The produce of wheat cultivation varies according to influence of soils. I would offer as an opinion, that nearly one-third of the whole lands under cultivation in Goruckpore are annually under wheat crops. Presuming that such opinion is nearly correct, then perhaps not less than Calcutta bazar maunds 7,660,000 of wheat are produced annually in this district, which is principally a grain district, and exports its produce to other places, viz., Benares, Agra, &c., in times of scarcity, through its own principal marts of Bansu, Gopalpore, Bhurruj, and Belwa, by water carriage.

Wheat sells in the district of Goruckpore, that is, buying from the farmer direct, at from 2 maunnies to 2½ maunnies, according to the greatness or scantiness of returns of the season, this equals about 34 seers to 42 seers Goruckpore weight, equal to about Calcutta bazar weight 41 to 51 seers per one rupee. If advances are made to the farmer on the returns of his crop in cash, 2, 3 or 4 months before harvest, 25 per cent. is generally taken and allowed above market ruling prices, when the new crops come into market.

The cost of conveyance from either of these marts to Calcutta is about 30 rupees per 100 maunds, Goruckpore weight, for boat hire, or say about 5 annas per maund if stored in bulk, a bad method; if in bags, the expence will be about one anna more per maund, insurance 3 per cent. *ad valorem,* and transit charges may come to one anna more, i. e. 7 annas per maund for boatage alone, which does not include inland charges for hackery hire from the granary to the shipping ghats: however, I think that even from Goruckpore, wheat can be landed in Calcutta, all charges paid, at from 1-8 to 1-12 per maund, Calcutta bazar weight.

Wheat will keep in good order any reasonable number of years even in India when properly packed and laid up; the method practised by the natives is, to stow the chaff or bhoosa a non-conductor of damp below, above, and all round their granaries inside, in the midst of this nest of chaff is placed the grain, slightly again intermixed with chaff; the principal object is to secure it against a damp atmosphere which ruins it, and is the cause of the weevil coming into life from the grain itself. This natural transmigration takes place by the action of a damp atmosphere working chemically on the different substances of which the grain-wheat is composed in a corrupted state.

I see no great difficulty or loss to be apprehended in a shipment of wheat to England, so far as damage to the grain is concerned, provided the cargo is shipped either in the cold or hot seasons, never during rainy or damp weather. It should then be either put up in large hogsheads, well secured and slightly intermixed with its own straw or chaff bhoosa; in such case the grain would be perfectly good even for sowing purposes. If such were not the desired object, but merely a large supply for food, then I presume that the grain should be made to pass quickly through a hot oven or over a sheet of well heated iron, so as to bear a slight scorching, such process would be sufficient to destroy all animal life, and keep the grain secure for all victualizing purposes in a colder and drier climate.

It has often occurred to me that India, as a great agricultural country, would have greatly benefited by encouragement of shipment of its bread-stuffs to England, and there is no doubt that means and methods would be found in abundance for the security of its grains against damp and weevils, if but a profitable market were open and upheld with encouragement in England. The early shipments of grain-wheat from this country, many years ago, were most likely made by adventurers, who paid but little attention to the influence of our Indian atmosphere on all vegetable matter: these things are better understood now, with the greater amount of mercantile ability now permitted to act in India.

I consider that a large supply of corn taken from India would very much enhance the interests of the landholders and farmers: it would tend to greater attention and improvement in agriculture and to the soil eventually. Land would become more valuable, whoever was the owner of it, whether the Company or the aborigines. Foreign money would flow into circulation in larger amount instead of going to America, France and all other European corn countries, and would thereby cause the Company's collectorates ever to be easily and readily replenished by *malgoozars*.

GORUCKPORE: I remain, &c.,
Bustee, 30th November, 1847. (Signed) W. COOKE.

Camp Hatta: 8th February, 1848.

TO H. C. TUCKER, ESQ.

MY DEAR SIR,—The accompanying, circulated I presume by you, reached me this morning.

My opinion is, that any attempt to ship wheat to England, such as is procurable in the eastern division of this zillah, would be attended with total loss.

The very last samples that I have seen since I have been in the district, are far inferior to what I have commonly seen near Mirzapore, Benares or Ghazeepore. The grain here is poor, small, contains a large proportion of bran, and is besides peculiarly liable to attacks from weevils.

(Signed) R. NICHOLSON.

Memorandum respecting Timber Trees and materials for Fuel.

By Dr. FALCONER.

[The following memorandum was prepared by Dr. Falconer, at the request of the Society, in reply to the undermentioned queries of Capt. O'Brien, of the Nusseeree Battalion. Under the impression that the information contained therein may prove serviceable to others, the Committee of Papers have much pleasure in publishing it for general information.]

Queries.—For France and other European countries, where wood is used for fuel, what means are taken to keep up the forests? Are there any books on this subject, and where is the best information obtainable?

What quantity of ground would be required to produce a continual supply of fire-wood for about five thousand people?

What would be the best kind of tree to plant for fire-wood merely, and not for other purposes?

After how many years does the willows' pollard reproduce faggots thick enough to burn, and where is the best information regarding the pollarding of trees obtainable?

In France and Germany, more especially the latter country, the forests are carefully looked after, under an organized system of management, conducted by rangers and foresters under a general scientific direction. The forests are for the most part enclosed: the products of thinning and pruning, and the refuse after felling, are turned to a thrifty account: felling is placed under strict regulation, and care is taken that the trees cut down are replaced by others, produced by natural sowing or reared by artificial planting.

The same system has been partially tried in India, and attended with similar results. Indiscriminate felling, under no restraint, was allowed to the native wood merchants in the great teak forests belonging to the Government on the Malabar Coast, and no provision whatever was made for the renewal of the trees cut down. The consequence was, that these forests became so utterly exhausted, that difficulties were met with in procuring a supply of suitable timber for gun-carriages for the Madras Presidency, and for the dockyards at Bombay. During the same period, the conterminous forests of Travancore, belonging to a Native Rajah, were under forest management, conducted by a European Superintendent. Besides a regulated system of felling, care was taken that for every teak tree cut down ten young trees should be planted. The results have been, that the Travancore teak forests have continued in the full vigour of supply and renewal, while the Government forests have been exhausted. Similar instances of apprehended exhaustion have occurred elsewhere in India from unrestrained felling, with no provision for renewal.

The forest lands in Germany are estimated to amount to about one-third of the entire surface. They consist either of the State forests or of forests which are the common property of the villages, both being alike under the guardianship of the State. The general management in the different States is usually vested in a Board of Forest Commissioners: the country is divided into districts corresponding with the internal civil divisions, and, according to the extent of the forest tracts, rangers and foresters are appointed. Every tree is known, and destined to a specific duration: and when felled, it is replaced by fresh planting prescribed by regulation. From the necessity that the towns and villages removed from river communication lie under, of having fuel and timber for consumption, the forests are not exclusively confined to the mountainous and uncultivable land. Every village has its supply of wood for burning and building from common forests, the felling and planting of which are regulated by the district foresters. In many of the States, Professorships have been founded in the Universities, for the express purpose of scientific and practical instruction regarding the growth and management of timber. These remarks are chiefly applicable to Prussia, Saxony, Bavaria and the States along the Rhine.

There are numerous English works on planting, and all the operations connected with it for scenic effect, and for the growth of trees for timber. Among these I may mention "Loudon's Encyclopedias," "Monteith's Foresters' Guide," "Nicol and Sangster's Planter's Calendar," &c. &c. There is also a great deal of information scattered through the articles in Loudon's "Arboret. et Fruticet. Britannicum." But at present I know of no English work to which to refer Captain O'Brien for the kind of information he wants, on the statistics of wood fuel as applicable to Great Britain: the abundance of either coal or peat, throughout the United Kingdom, rendering wood an article of only partial or subordinate consumption as fuel. I am not aware of any statistical returns on record on the subject.

The most comprehensive French works on planting are Du Mont's "Botaniste Cultivateur," in 6 vols. 8vo., and Baudrillart's Traitè General des Eaux et Forêts, 5 vols. 4to. The German Literature in this department is very extensive, and, in consequence of the situation of the country and wants of the people, more exact and detailed than any other. There are numerous "Baumzucht's" or Guides to Arboriculture, and one or more "Jahrbuchs" devoted to forest management. The latest English information on the management of the German forests, to which I can refer Captain O'Brien, is contained in Banfield's "Industry of the Rhine," a small work published in 1846.

With regard to Capt. O'Brien's next query, as to the quantity of ground necessary to produce a continual supply of fire-wood for 5000 people, it is so indefinitely expressed, as hardly to be susceptible of a definite answer, as applicable to India. For the consumption must vary exceedingly with the climate, and consequently with the habits of the people.

In the plains of Hindostan, by much the greatest part of the fuel consumed is cow-dung: the consumption of fire-wood proper is comparatively small. Whereas in the hills, at elevations where the climate is temperate, and the winter long and severe, the consumption of fire-wood for cooking, and artificial temperature, must be very much greater. The consumption may be expected to increase in the ratio of the altitude.

Supposing a climate in this country corresponding in consequence of elevation with the western parts of Germany, and that the wants of the people were similar, we may approximate to an estimate. In the Rhenish Provinces of Prussia, the population is reckoned at about 2½ millions of inhabitants, and the quantity of land under forest is estimated to amount to nearly 2 millions of English acres: the surface occupied by forest, being to the cultivated land, nearly in the proportion of 3 : 4. This would give .8 acre of forest land for all purposes of timber consumption and fuel, per inhabitant. In Baden, through the whole length of which the "Black Forest" stretches, the forest lands occupy about three-fifths of the entire surface of the Duchy: they amount to about 810,044 English acres. Estimating the population in Baden at 1,300,000 inhabitants, this would give about .625 English acre of wood consumption, per inhabitant. In Baden 70 per cent. of the wood annually felled is consumed *as fuel alone.* This will give .437 acre of forest land as the consumption for fire-wood by each inhabitant.

The best kinds of wood to rear merely for fuel, are the most rapid indigenous growers of the country. Such (in Europe for instance) as the pines, firs, larch, willow, poplar, &c. In Germany, "beech" is considered the most productive fuel timber, and is reared for fire-wood solely. Capt. O'Brien need not look beyond the native trees of the Himalaya at different elevations: for no introduced trees could furnish better materials. All that is wanted is conservancy in regulating the felling and cutting, so as to prevent a tract from being cleared of wood, and suitable means being taken for the renewal of the trees cut down.

At the elevations corresponding with Simla and Mussooree, such trees as *Rhododendron arboreum, Andromeda ovalifolia, Quercus incana, Pavia Indica,* (Himalayan horse chesnut) *Pinus excelsa, Populus ciliata,* and the arboreous forms of *Euonymus, Cornus, Benthamia,* the *Laurineæ, Carpinus, Ulmus, &c.,* with species of *Acer,* furnish the most ample materials for native supplies of fuel.

My friend Capt. Vicary, of the 3rd European Infantry, now stationed at Subathoo, can supply Capt. O'Brien with excellent and accurate information on the spot, respecting the indigenous Himalayan trees here referred to. If an introduced species is requisite, beech is the best and most suitable.

Notes on certain species of Silk-worms indigenous to India.

By B. H. HODGSON, ESQ. *and* R. W. G. FRITH, ESQ.

I have the honor to forward herewith sample of the silk of the wild worm of the *saul* forest, with cocoon of the wild (large) and tame (small) silk-worm of the *saul* forest; also drawings of the moth, caterpillar, cocoon and crysalis of these worms. The silk, wild and tame, appears interesting. The large worm (wild) feeds on the *saul* tree *(Shorea robusta),* the fibre yielded is very strong, and must surely be that known to classic commerce, and used by the Romans for the manufacture of the awnings of their immense theatres. This worm seems to be the *Deo Moonga* of Assam, but I am not sure. The drawings will, however, enable an entomologist to decide, for they are very accurate and of full size. The larger is the wild-worm, the smaller, the tame, and the latter is, I think, identical with the common castor-oil worm of Assam and elsewhere; but still it is interesting, as being reared in the *saul* forest *so far west as the Cosi.* I shall be glad to hear what the Society think of the two species of silk-worm.

Darjeeling : 8th January, 1848. B. H. HODGSON.

The drawings received by the Society from Mr. Hodgson, and handed to me for inspection, are undoubtedly (the larger one) that of the Tusseh silk-worm of India,* with moth and cocoon; (the smaller one) that of the *Arrindy* or *Eria*† worm of Assam, and north-eastern parts of Bengal.

The former, Mr. Hodgson seems to think, is the *Deo Moonga* of Assam. But according to Mr. Hugon (see Journal of Asiatic Society, Vol. vi. part 1, page 32), the *Deo Moonga* is quite a different insect, and seems to be very rare in Assam, and is found only in the wild state. This is the *Kontkuri Moonga* of the Assamese, and *Gootee-poka* of Bengal.

The drawing represents the perfect insect, the caterpillar and cocoon, all of life-size. They are very fairly executed, but the artist has committed one great error: he has figured the female moth, and given to it the deeply pectinated antennæ of the male insect, otherwise they are correct enough.‡ The antennæ of the female of this moth are, as is usually the case, when this one sexual difference exists in the noctuidæ, but slightly pectinated and larger than those of the male, and indeed though the specimen be ever so fresh, appear as if the feathered part had been worn off.

As far as my acquaintance with this beautiful insect extends, I believe it to be found throughout the whole of this side of

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* *Phalæna mylitta,* Drury, Exot. Insects, Vol. i., pl. 5, fig. 1; *Bombyx mylitta*, Encyc. Method.; *Phalæna paphia*, Cam. Pap. Exot., pl. 146, fig. A., pl. 147, figs. A. B., pl. 148, fig. A.

† *Phalæna cynthia,* Drury, Exotic Ins., Vol. ii., pl. 6, fig. 2.

‡ I have thought it as well to introduce here just a portion of a drawing of the female moth, showing the antennæ as they should be. This drawing I have taken from one of my specimens from Kussowlee, purposely that Mr. Hodgson may see the color of it, as differing from the general rich yellow of the female.

India, that is to say, from the north-western range of the Himalaya direct south as far as Midnapore, and also through the north-eastern range to Assam and southwards to Chittagong. I have no doubt but that it extends further, but cannot state so from my own experience. Dr. Royle, in his volume on the productive resources of India, states that it was found by Colonel Sykes in the Bombay, and by Dr. Geddes in the Madras Presidency.

I have seen it from Mussooree, and have it in my own collection from Kussowlee, Darjeeling, Assam, Cheera Poonjee, Sylhet, Chittagong, from Chota Nagpore, and from several of the districts of Bengal. In Bengal I have taken the larva at all seasons of the year, excepting during the cold weather, when the trees constituting its food are leafless.

It is most abundant, I am informed, in the Bhaugulpore district, when the cocoons in their proper season are collected by hackery-loads for the manufacture of the *Bhaugulpore* or *Tusseh silk*, as it is called, and now so well known. A tolerably correct description of this moth is given in the 7th volume of the Naturalists' Library, (Entomology) page 146. The illustration of it at plate 14, fig. 2, which by the bye is that of the male insect, is furnished with antennæ of the female insect, the very opposite error to that made in the drawing sent down by Mr. Hodgson. Plate 15 of the same volume, figs. 2 and 3, are the larva and pedunculated cocoon of the same, but they are very bad figures. In the above volume it is stated,—"when these caterpillars approach near their full size, they are too heavy to crawl in search of their food back up, as is usual with most caterpillars, but traverse the branches suspended by the feet, see plate 15, fig. 2." The writer here, it appears to me, has decidedly brought forward an erroneous idea with the view of pointing out the unwieldy size the creature attains, and which is more correctly and sufficiently shown by the measurement given of it. It is not on account of the great size of the larva that it is obliged to take to the under side of the twigs to enable it to traverse them in search of food, for it can pass along them in any *position* when they are *strong* and *thick* enough for its powerfully clenching feet to find sufficient to grip hold of. It is clear when the larva approaches the ends of the thinner branches and twigs, (which it frequently does, having taken it on some so slight, that it has been in perfectly pendant position,) it would be impossible for it to travel with ease to itself in such position as to keep itself *upwards:* it therefore prefers taking the *under* side of the twig, and passes along it in a suspended position, with the aid of its powerful feet, for it takes some little trouble to make them release their hold when once firmly fixed.

I have known the perfect insect make its appearance out of the cocoon in the rainy season in about 20 days. A great deal depends however upon the temperature and state of the atmosphere, as to the number of days that are required, ere the moth makes its exit from the pupa state.

The food of the caterpillar seems to be confined to the leaves of but a few trees: I found it only upon the *bair (Zizyphus jujuba)*, both wild and cultivated kinds, and on the *badaam* or country almond *(Terminalia catappa)*. Mr. Hugon states, that it feeds in Assam, not only on the *moonga* trees, but also on the former of those mentioned above, and on the *Semal (Bombax heptaphyllum)*. Dr. Helfer describes it as being taken upon and from other trees, and these are transplanted on to the *Assun (Terminalia alata)*, but that they feed most commonly in the wild state on the *bair* tree *(Z. jujuba* and *Bombax heptaphyllum)*. Mr. Hodgson again has discovered that its food is the *saul* tree *(Shorea robusta)*, which is interesting.*

Dr. Helfer, at page 43, Vol. vi. part 1, for 1837, of the Journal of the Asiatic Society, states, that according to

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* Since writing this I have been informed by a friend, that in the Midnapore district the caterpillar feeds upon the *saul* also.

Michael Atkinson of Jungypore, this species cannot be domesticated, because the moths take flight before the females are fecundated. Dr. Helfer's opinion does not bear out the truth of this remark, and I agree with him as he further states in continuation, that having kept them in a musquito curtain to prevent their escape, they were readily impregnated by the males, and deposited thousands of eggs. The moths no doubt, both male and female, will fly away if not confined in any manner to prevent them, particularly the males, for the sole purpose of seeking the females. I am of opinion, that this silk-worm might be reared and domesticated with very little care and attention. A female for instance, produced from the cocoon and retained captive, can, as above stated, be readily impregnated by the males, which are so eager for the intercourse, that I have at times taken as many as from 10 to 15 individuals in the course of a couple of hours, between the hours of 2 o'clock and 4 in the morning, and that for three or four nights in succession, with the aid of the same decoy female. The moths, both male and female, live for about 10 days, if they are not allowed to approach each other for the purpose of reproducing their species, and this without food of any kind, seeing that they are not provided by nature with a mouth. The following (which reached me after I had penned the foregoing remarks) is a description of the mode adopted at Bogree, in the Midnapore district, for rearing this worm in a state of confinement, and for which I am indebted to Mr. Charles Blechynden, Superintendent of the Radnagore silk filatures :—

"Cocoons for seed are purchased in the month of *Pous* (December) and *Maugh* (January) at 15 or 16 *gundahs* per rupee : they are hung in a pot for four months, or till about the 13th *Bysack* (April), when some of the moths come out of the cocoon and are removed into another pot, and kept there for a fortnight ; during this period eggs are laid.

"These eggs are now put into *saul* leaf boxes for four days, at the end of which time they begin to hatch, and are placed on clumps of either *Assun* or *saul* branches. After two or three days, the worms growing stronger, no very great care is requisite, save to remove them from one branch to another when they have eaten all the leaves of that which they are on; this is effected by cutting down the branch and placing it against another. In three weeks these worms weigh two chittacks each; they cast their skin three times, after which they spin and are brought home, when they undergo boiling, and are after that fit for sale: those intended for seed of course are not boiled.

"There are two *bunds*, first in the month of *Joisty* (May), second in the month of *Srabun* (July).

"The *castes* that follow the rearing of worms as a means of livelihood are "Coormee," "Bhoomy," "Naick" and "Manjee."

"During the period the worms are on the trees, men are on the watch night and day with bows, to drive away the birds, their greatest enemies.

"In Purgunnah Bogree—

Rent of one *aurah*, equal to 4 biggahs, Rs.	2	12	0
In Goaultom each Assamee, ...	0	8	0
In Nuah *busut*, ditto, ...	0	10	0

"The price of cocoons is never fixed; eight *puns* make one *kahun*, which sells for 3-8, rising sometimes to 4-8.

"To manufacture the cocoons into a thread, they are boiled in cow-dung and water, and drawn out into a fibre on a hand reel."

Mr. Hugon states, that the Natives consider there are two varieties, the *Bhugy* and *Jharroo*. I do not think so. I believe them to be one and the same insect. The larva sometimes, for instance, when feeding on the common *bair* of the jungles, is of very dark green color, precisely that of the leaf itself, and might by some be considered as a different insect, when compared with one that has fed on the *badaam (T. catappa)*, which is of a much lighter and prettier green, with a degree of transparency at the same time, and a slight tinge of yellow pervading it.

The fact of the perfect insect being devoid of any mouth has led me to infer, that the secretion, which it emits for the purpose of softening the substance of the very hard cocoon from which it has to make its escape, is voided from the abdomen; and when effected, it has to turn *itself round in the cocoon* to enable it to set to work, with its two fore-feet, which are provided with extremely strong and curved claws, and thread by thread, works for itself an opening through which, while yet moist, its escape from the cocoon is effected, and that too before its wings have in any way enlarged by expansion to impede its exit. It is my intention during this next rainy season to endeavour to ascertain this point beyond any doubt if possible; also the examination by analysis of the fluid emitted by the insect for thus softening the glutinous substance used in forming its cocoon.

The second drawing which Mr. Hodgson has sent down, representing the *Arrindy* or *Eria* moth of Assam, is stated by that gentleman to be the Indi moth of the Mechis. This, I take it, is a mere abbreviation of the word *Arrindy,* for in the Bograh district, I have remarked, that they call it the *Rindi* or *Renri-ka-poka.* This insect is domesticated in the Dinagepore, Rungpore and Bograh districts. Its food in Bengal is confined entirely to the leaves of the castor-oil plant *(Ricinus communis)*. Mr. Hugon states, that when this plant fails it is fed upon several other trees in Assam, known by the following names—1st *Kossoal,* 2nd *Hindoo Gass,* 3rd *Meekeerdal,* 4th *Okonnee,* 5th *Gomarree,* 6th *Litta Pakaree,* 7th *Borzonolly.* The above are forest trees, none of them being cultivated.

At page 23 of the *Asiatic Society's Journal,* Vol. vi., part 1, for 1837, further interesting particulars will be met with in Mr. Hugon's observations on the silk moths of Assam.

Darjeeling: June 17th, 1848.

My dear Sir,—I have the pleasure to acknowledge your interesting communication on the silk-worms I sent you. My impression that the larger moth was identical with the *Deo Múnga* of Assam, was derived from Major Jenkins, I having no opportunity at the moment to refer to Mr. Hugon's paper in the Asiatic Society's Journal. To judge by my specimens the sexes of this moth are distinguished not only by the more deeply pectinated antennæ of the male, but by its *quasi plum bloom color,* so different from the pure rich yellow of the females. With regard to the distribution of the species, I apprehend that Mr. Frith is mistaken in supposing it does or can occur in climates like that of Darjeeling, for I not only never heard of the species here, but have failed in an experiment to rear it, which was carefully conducted under favorable circumstances, from cocoons got in the *saul* forest, by Mechis in my service, who are habituated to rear the tame species. Gentlemen who make collections in this quarter are apt to blend whatever they procure from the Tarai forest, and lower hills, and from the mountains above them, and I conjecture, that Mr. Frith's specimens of *Phalæna mylitta,* said to come from Darjeeling and Cherra Poonjee, were really obtained in the low lands beneath those places. I notice this point because of the numerous and important mistakes relative to the geographic distribution of Zoological and Botanical species which have thus been propagated. For example, Mr. Ogilvy was led in this manner to suppose an Otine bird *(Eupodotis Bengalensis),* an inhabitant of these vast and precipitous and heavily wooded mountains, and to name the species *Hemalayensis,* though it be really as little capable of dwelling in such a habitat as is, I apprehend, the *Phalæna mylitta,* or, more generally, any species of silk-worm whatever. Silk-worms abound south and east upon or near the level of the plains, but I doubt if they pass the limits of Bengal in a north-westerly direction, even upon the plains; and, so far as I know, the Cosi river is their limit in that direction; nor do I believe, they are ever found tame or wild at elevations materially above the plain level in Bengal or in Hindostan. In the *saul* forests they may pass up towards the north-west as far as that forest extends, or to Hurdwar. But the *saul* forest is hardly elevated at all above the level of the adjacent plain; and Cherra at 4,000 and Darjeeling at 7,000 differ *toto* *cælo* in characteristic productions, as in climate, from all places situated on the low open level of the Gangetic plains. The species identified by Mr. Frith with *Phalæna mylitta,* avoids the open plain, as well as the mountainous heights; and, as seems to me, is exclusively confined to primitive forests or the level, or near it, of the plains. If therefore the species be found wild in Bhaugulpore, Sylhet, Chittagong, or even Chota Nagpore, it is, I apprehend, confined in all those districts to the uncultivated and forest tracts at the base of their respective hill ranges. Further enquiry as to the food of the wild worm of the *saul* forest confirms my prior information, that this species feeds almost if not quite exclusively on the leaves of *Shorea robusta;* and, as that tree extends not westerly beyond Hurdwar, the habitat of Kussowlee appears to me dubious, unless there be some mistake about the species.

The above remarks may seem tiresome. But those who are aware of the stress now laid on the geographic distribution of species, and of the numerous errors of fact that have crept into the subject, as relates to this quarter, from the source above adverted to, will probably deem otherwise. My attention was drawn to the subject of the distribution of silk-worms in India, with reference to the notices which the classics have left us of the ancient trade of India with the west, in the Roman times particularly. In a long and valuable dissertation by Mr. Taylor, in the Journal of the Asiatic Society of Bengal, that gentleman had attempted to show that Assam was the *Serica regio* of the classics. But by a comparison of the principal commercial products of Assam, cited by Mr. T. in confirmation of his theory, with those of the Tarai and forest generally, or as far north-west as Hurdwar, I found that most of the assumed exclusively Assamese articles of trade, were not less products of the north-western continuation of that peculiar tract of country, *which alone, whether in Assam or beyond it towards Hindostan, yields those products.*

Silk however, seemed to me at first an exception, and it was therefore with pleasure that I discovered that different species of the worms producing it were found in the depths of the *saul* forest as far north-west as the Cosi, both in the domesticated and wild state. I doubt however whether the wild worm be found very much beyond that river, which may properly be called the natural boundary of Bengal towards the north-west; nor am I aware that any species of silk-worm is reared in the domestic state by a tribe or caste of people in Hindostan Proper, that is, the region bounded towards the Deccan and Bengal by the Vindhia, and a line thence drawn to the Cosi at Nâthpûr. "That which hath been is that which shall be;" whence those who are interested in the resuscitation of the industrial energies of the people of India reasonably turn in search of good omens for the future to the gorgeous accounts left us of the old Indian pelagic trade under the lower empire. Would we revive this trade we must learn accurately what India produces, and what are the special products of her several provinces, so that the scientific investigation of the distribution of species may very materially subserve important economic uses.

B. H. Hodgson.

In remarking further on Mr. Hodgson's observations in reply to my first notes on the Tusseh moth of India, I have to state, that I did not therein give any description of the two insects, male and female, further than casually pointing out (in consequence of the error committed by Mr. Hodgson's artist in figuring the female insect with the antennæ of the male) that *one* characteristic distinction between the two sexes. I did not do so, as I had stated that a tolerably correct description of it was to be seen in the 7th volume of the *Naturalists' Library* (Entomology), page 146, and that this book might most probably be accessible to Mr. Hodgson. Mr. Hodgson is perfectly correct when he states that the sexes are distinguishable not only by the deeply pectinated antennæ of the male "but by its *quasi plum bloom color.*" There are, however, other considerable differences. The male, for instance, is almost always much smaller than the female: the wings never so deep or broad, nor so much rounded, but narrower and strongly falcate. The general color is something of a yellowish-brown, varying much in tint; indeed I have seen them almost as yellow as the female. Again, I have at the present moment a female in my collection that is as dark and of the same color as the males generally are. Two specimens of females I have also from Kussowlee, rather I should say I have four altogether, all females, from that locality, two of which are of the pure rich yellow color, described by Mr. Hodgson, the other two of a pale slaty color, and such as I never before met with. All the other markings are exactly the same as in the yellow-colored ones, and they are, beyond dispute, nothing but a variety of *Phalæna mylitta*, or the true Tusseh moth.

Regarding the geographical distribution of the species, I am almost at a loss how to satisfy Mr. Hodgson as to the circumstance of its being found at Darjeeling, having received it from thence myself, from a party collecting for me. Again, those from Cherra Poonjee were collected by persons on the spot who are employed by me for the sole purpose of forming entomological collections. I have just inspected a very fine collection, made by a gentleman at Mussooree, in which are no less than eleven species of true *Bombycidæ*, viz. nine of the genus *Saturnia*, all new to me, and I have no doubt every one of them unfigured, and even undescribed; one of the genus *Arctias*, and one of *Phalæna mylitta*, or the true Tusseh moth. In my own collection, besides, I have three I consider to be new and undescribed, from Cherra Poonjee, one from China, and one from the Cape of Good Hope, or say Southern Africa. Capt. T. Hutton also, in the Transactions of the Entomological Society, Vol. iv., part 3, page 221, in a letter addressed to J. O. Westwood, Esq., gives an account of the preparatory states of *Bombyx (Arctias) Silene* of India. These, as well as other specimens, were taken by him at Mussooree. Further, in another letter to the address of the same gentleman, dated from Mussooree, and published in Vol. v., part 2, page 45, of the Transactions, Capt. Hutton makes mention of his having frequently watched the escape of the Tusseh moth from the cocoon by the aid of the liquid it brings into use for that purpose. I conclude, therefore, that he has also found them there.

But what will Mr. Hodgson say to the following description (with which I must conclude for the present) of a *new* Indian silk-moth discovered by Capt. Hutton at Mussooree, and a *true Bombyx* moreover? The following is the notice of it in Vol. 1, second series, of the *Annals and Magazine of Natural History, p.* 385 :—

"J. O. Westwood, Esq., F.L.S., exhibited specimens of the silk spun by the caterpillars of the new Indian silk-moth, *Bombyx Huttoni, West.* (figured in the *Cabinet of Oriental Entomology,* pl. 12, fig. 4) communicated to him by Capt. T. Hutton. After stating the importance of the discovery of a new and valuable product of this nature in our foreign territories, and that the Transactions of the Linnæan Society contained a valuable paper on East Indian silk insects by General Hardwicke, Mr. Westwood observed that the insect discovered by Capt. Hutton was congeneric with the real silk insect *Bombyx mori,* a native of China, whereas those described in the Transactions of the Society belonged to another genus, *Saturnia,* and that, consequently, the silk spun by the new species was likely to approximate nearer to that of *B. mori* in its qualities than that of the large Indian *Saturniæ.* The new species had been discovered to be a native of the hills about Mussooree, on the southern side of the Himalaya, 6,500 feet above the level of the sea; and its caterpillars, like that of *B. mori,* feed on the leaves of the wild mulberry, which is another reason why the qualities of the silk should resemble that spun by the true silk-worm. The perfect moth is about the size of *B. mori,* but has darker-colored wings, with a large blackish lunate spot near the tips of the hooked forewings. Specimens of the natural fibre of the silk, and some with the threads severally composed of three, six, nine and twelve fibres, having been pronounced by the Delhi silk workers to be worth 25 rupees per seer, that is, about 25 shillings per pound, at 2 shillings per rupee."

I may, perhaps, at some future date, offer some further remarks on the distribution and habits of the Tusseh moth, when I have obtained more certain data to guide me; and which, I trust, may prove more satisfactory to Mr. Hodgson.

Calcutta : July, 1848. R. W. G. FRITH.

Darjeeling : August 17th, 1848.

MY DEAR SIR,—I have the pleasure to acknowledge your second obliging communication on the subject of silk-worms. Their wide diffusion throughout the continent of India in the plains seems clear, and is a very interesting circumstance with reference to what we find in the classics about the trade of India with Europe in the latter days of Rome and thereafter. Mr. Taylor supposed that the chief "things in commerce" in those days were products of Assam only. But I had long before traced most of them as indigenous products of all India extra Gangem, from Suddiah to Hurdwar, leaving silk only as an apparent exception. It need be so no longer: fine wild worms of various kinds being, it now appears, found north-west all the way to the *debouche* of the Ganges into the plains. So far then, I agree with Mr. Frith, and thank him much for the information he has supplied. But I confess myself still quite a sceptic as to the alleged fact of the silk-worms tenanting these mountains at elevations like that of Darjeeling, and I have lately enforced my doubts by strong negative evidence, to wit,—There are now here two enthusiastic entomological collectors, who have made splendid collections. To them I sent my silk-worms, desiring to know if they had any specimens. The answer of both was—"Nothing of the sort seen or heard of at Darjeeling, either in glen or on hill top." I apprehend, therefore, that Capt. H.'s and Mr. F.'s specimens were not got at Mussooree or Darjeeling, but in or near the plains in the vicinity of those hill stations.

B. H. Hodgson.

Since the above has been put in type, I see by Mr. Hodgson's last communication, that he still will not allow the possibility of silk-worms inhabiting such an elevated mountain range as that of Darjeeling; and states further, that he has enforced his doubts by strong negative evidence from the fact of there being at present, resident at Darjeeling, two enthusiastic entomological collectors, to whom Mr. Hodgson has shown his silk-worms, and these gentlemen declare that nothing of the sort has been seen or heard of at Darjeeling "either in glen or on hill top." Now, I beg to say, with every deference to Mr. Hodgson and these two gentlemen, that I do not consider that because the latter have not seen or heard of the Tusseh moth at Darjeeling that it should be a proof of its non-existence in that locality. Surely it is much more likely that it does exist there, from the circumstance of its being found in the whole of the eastern range of hills from Chittagong up to Assam, at such an elevation as Cherra Poonjee, and again in the western Himalaya, at Mussooree and Kussowlee, the former only 500 feet below the elevation of Darjeeling. Besides, it often occurs that one collector may capture one or more specimens of an insect in the same locality where others may be less fortunate, and procure none at all, from various causes that occasion the existence of members of the insect world from being found in fewer or greater numbers in corresponding seasons in one and the same locality. As long for instance as I have been collecting, I may mention one fact to the point, that of my never having taken a single specimen of the genus *Paussus;* I do not however doubt for a moment the possibility of its existence in this part of India, indeed I know several specimens to have been secured in the district of Furreedpore by a brother collector.

Calcutta : August 28th, 1848. R. W. G. FRITH.

Memorandum regarding various Fibrous materials from Assam and Chittagong.

Since the commencement of the present year, the Society's Museum has been enriched by several specimens of vegetable fibres forwarded by its zealous correspondent and member, Major Jenkins, the Commissioner of Assam. These specimens have been presented, as received, at the various monthly meetings, and certain details regarding them simultaneously communicated. To bring these particulars into a continuous form, and give them the prominence which, it is deemed, the importance of the subject merits, is the object of the following memorandum.

I.—Fibre of the *Rheea* of Assam, *Calooe* of Sumatra, *Urtica tenacissima,* Roxb. A reference to Roxburgh's "Observations on substitutes for hemp and flax," will show that that eminent practical botanist, was well acquainted with the useful properties of this plant, and endeavoured long ago to bring it to the notice of the Indian Government. In a letter addressed in 1809, to the Secretary to the Board of Trade, he thus writes :

"I have received your letter of the 17th instant, with the two extracts therein mentioned, and beg you will be pleased to inform the members of the Board of Trade, that since the beginning of my botanical career, no plant has given me more anxiety than that which produces the *Calooe.*

"From the receipt of the first sample sent to me by Mr. Ewer, from Bencoolen, I saw its quality was uncommonly interesting, and promised to be superior to every other vegetable fibre I had seen. I was therefore more than usually solicitous to obtain the plant which produced so promising a material, as a substitute for both hemp and flax, and in 1803, four were received into this garden from Mr. Ewer, at Bencoolen; since which period, some thousand plants have been reared from these four, so readily does it grow and multiply. But to this day, I have not been able to discover a ready way to clean the fibres. At present, a man rarely cleans more than half a pound in a day, which alone comes to sixteen rupees the maund. I understand the Malays on Sumatra follow the same mode of cleaning which I have hitherto found the best, viz. by scraping away the pulpy parts, &c., immediately when peeled from the fresh cut shoots: no kind of maceration nor coction have I found to answer; however, as I have applied for information to various quarters, and am still making experiments myself, I do not yet despair of falling on a more profitable method than scraping. The plant has every advantage we could wish in growing readily in this country, being perennial, and yielding three or four crops or cuttings annually; so that if we can only overcome the obstacles that now present themselves in cleaning the material, I am inclined to think it would, in the course of time, supersede every other, for canvas and cordage, yet known. I would therefore, by all means, recommend as extended a cultivation as the plant will admit, which must be very limited for years yet to come, because it has not hitherto produced good seed, nor even from its native country could I ever obtain any, which is scarce to be expected from a plant usually reared from cuttings and slips, (as in the common pine-apple, plantain, &c.,) a mode of culture which soon deprives them of fertile seed. This plant must therefore be multiplied by suckers, cuttings, and layers, which can best be done during the rains."

It is not mentioned if this recommendation was attended to, or whether any further experiments for a readier mode of preparing the fibre were attempted.

The Society, it may be observed, has received various specimens of this material at different periods, in addition to those to be hereafter noticed, but it does not appear that any of them have been fairly tested or reported on. It was sent by Major Jenkins from Cachar in 1833; and subsequently from Assam. He describes what he procured in the first-named province, "as more like good hempen twine than that made from any plant in India, and from one small sample I saw well bleached, it would, I imagine, make a very neat canvas."—(Transactions volume 2, page 171.) Col. Burney also, when Resident at Ava, sent a specimen, the produce of the Shan Provinces of Pevela and Youkzouk, lying 6 or 8 days' journey to the south-east of Ava. He speaks of the superior quality of the material, observing he was informed that the Shans, who call it *Pan*, "use it in manufacturing every kind of cordage, and weaving a stout kind of cloth, of which they make bags."—(Volume 3, page 11.) Major Macfarquhar likewise forwarded some of it, raised at Tavoy on the Tenasserim Coast, from a few shoots sent to him by Col. Burney, from Ava in 1836. "It is cultivated," he remarks, "by the Shans, Siamese, and the Chinese; the two latter, with whom I have spoken on the subject, are loud in its praise for its fineness of texture and durability, both as cloth and cordage."—(Volume 5, page 19.) Again, at a later period, specimens were submitted by the late Mr. Landers, a traveller in the Shan country, who corroborated, from personal experience, the information obtained by Col. Burney.—(Journal, vol. 2, p. 253.)

In the first part of the present volume, will be found an interesting paper descriptive of the mode of cultivating this plant, and preparing the fibre in Rungpore, in which, as also in the neighbouring district of Dinagepore, it is known under the name of "*Kunchoora.*"*

The specimens noticed above, and last forwarded by Major Jenkins, consist of—

1. A specimen of cultivated *Rheea*, sent to Major Jenkins by Major Hannay, "in just that state in which it is prepared by the Assamese fishermen."

2. Also a specimen of the same, prepared and bleached by Mr. G. H. Grose; and

3. Another specimen of textile fibre from Major Hannay, called *Bon Rheea*, "an uncultivated *Urtica*, very common in all parts of the Province."

On these specimens Capt. Thompson reports as follows:—

No. 1. "The fibre in this state possesses all the properties of hemp for making cordage; hackles easily and leaves very little waste. It is rather rigid and wiry for ship use, but in my opinion, were it the least more flexible, it would make excellent cordage for any purpose. I am preparing some of it with tar, and when I have ascertained how it stands that test, will report more fully.

No. 2. This specimen is injured, I think, by being too much bleached, the fibre has lost its strength and staple, and in attempting to dress it with the hackle, three-fourths of it remained as seconds, part of which I have had spun into twine (herewith sent), but from the cause above stated, it has not near the strength of the other samples. The "sail-cloth weavers" say it would make excellent canvas if less bleached.

No. 3. This specimen speaks for itself: it is, I think, all that can be desired for either canvas or lines, and only requires to be known to be generally used for that purpose. This specimen, as well as No. 1, from the method of preparation, being all in small twisted quantities, and dried in that state, resisted the hackle, and cannot be dressed without much waste and injury to the fibre."

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* Notes on the *Kunchoora* fibre of Rungpore, by Dr. Campbell, Superintendent of Darjeeling, and T. F. Henley, Esq.—Part 1, Vol. vi., p. 30.

II.—Fibre of ***Bauhinia scandens***, and cloth made therefrom. These specimens were also sent to Major Jenkins by Major Hannay, who mentions that the fibre is used by the Nagas. The plant, Major Jenkins adds, is not uncommon about Gowhatti. It was recognized by Dr. Falconer, from a few leaves forwarded by Major Jenkins, to belong to ***Bauhinia scandens***, a common species in Sylhet, and he adds—"The fibres produced from the maceration of the bark of two other species of the same genus, viz. "***Bauhinia racemosa***" and "*B. parviflora*," are extensively used in making a rough description of cordage in the low valleys of the hills on the north-western provinces, specially for rude suspension bridges. The produce of a species of *Bauhinia* was one of the substitutes for hemp reported upon by Dr. Roxburgh."

Captain Thompson having tested this fibre reports on it to the following effect:—

"The line made from the fibre, sent by Major Jenkins, sustained for 45 minutes, 168℔s., having stretched 6 inches only in 3 feet, and therefore is about the same strength with our best *sunn* hemp. But whether from the mode of preparation or the nature of the material, is so harsh and stubborn, and the fibres stick so close together, that the hackles tear it to pieces, and injures its strength. I made the same remark on the samples of *Rhea* from Assam, and suppose it must arise from the mode of preparation."

III.—Primitive cloth made from the bark of *Celtis orientalis*. This specimen accompanied that of ***Bauhinia scandens***. Major Jenkins intimates, that it is made by the Garrows; "they make several such cloths of different colors from various barks, and though these manufactures would seem cheap enough, they are not usually at the expence or labor of even such rough clothing for themselves; preferring apparently to go naked; they import at least 100,000 maunds of cotton, but to my knowledge do not weave a seer for themselves. The Garrows who come to the plains have generally some small ends of cloths, but these are bought from the Bengalis, apparently to attend the *hauts* in, not as clothing to protect them from wind and weather."

.— And Dr. Falconer gives the following additional particulars on the subject:—"The leaf specimens from Major Jenkins, are those of *Celtis orientalis,* a tree which is pretty common all over India, and known under the name of "Chekon" in Bengal. It is botanically closely allied to the "Elm," but it is not prized as a timber. Dr. Roxburgh's summary of it is, "this tree is neither useful nor ornamental, nor is it of long duration." The cloth produced from it by the Garrows, was described by Buchanan Hamilton many years ago. He calls it "Jangfung," "probably misprinted for Yangfung," as Capt. Reynolds names Major Jenkins' specimen "Amfuk." B. Hamilton says, "the under bark of this tree, like that of the West India kind, consisting of numerous reticulated fibres, form a kind of natural cloth used by the Garrows for covering their nakedness."—Lin. Trans. 17, p. 209. He also describes it in his report on Assam as a kind of rug worn by the Garrows in the cold weather, and serving them as a blanket by night.—Vide M. Martin's Eastern India, vol. 3, page 694. It would be interesting to know what the other cloths mentioned by Major Jenkins are produced from."

IV.—Fibre of *Callicarpa cana.* For this specimen the Society is indebted to A. Sconce, Esq., Collector of Chittagong, who in a letter, dated March 1848, to the address of the Secretary, thus writes regarding it: "I send you a small package containing some of the fibre of a plant which you named for me in July last, and which appears to me worth the notice of the Society. You may remember I sent you the leaf of a plant which grew in the jungles here very much in the *fashion* of the *Urtica tenacissima.* This you were good enough to inform me was the *Callicarpa cana.* I had a considerable quantity of the stalks cut and steeped. By steeping, the outer bark rotted and smelt as offensively as hemp, and the inner fibre slipped off. This fibre, after being dried, I had hackled, and what I send you is a specimen. I had also a portion spun; and though this has been coarsely done, it will be sufficient to show you that the fibre gives a very strong thread.

"The stalks of the plant grow three or four feet high; many stalks from one root. Should this plant be found in the neighbourhood of Calcutta, could any one who is skilled in the preparation of hemp, be induced to experiment with it? I could easily send several bundles for that purpose; but I rather think that unless the stalks be steeped immediately after being cut, the fibrous quality of the bark disappears.

"In one respect, this plant has a decided advantage over the *Urtica,* namely the readiness with which the fibre is separated from the wood. I think also that the fibre is strong and comparatively fine, what I cut last year were stalks of an unlimited age. This year, I shall be able to cut some of this season's growth."

And in a subsequent communication he adds:—"I find that the stalks much improve in size by cultivation, but I have not yet extracted the fibre from the shrubs which I transplanted. The native name of the plant here is *Aroosha.*"

Captain Thompson, to whom this specimen was also referred, thus reports on it:—

"The line made of the fibre of *Callicarpa cana,* sent from Chittagong, broke at once without stretching, with only 127 pounds; only the finest and longest of the material was made into this line, while in the other (the sample was so small) that the refuse was worked up with the best. A line of Russian hemp of the same size with the two herewith sent, will sustain with ease 400 pounds, so that this fibre is much too weak for either sail-cloth or cordage.

"It however possesses all the free and kindly nature of flax, and even smells like flax; it is easily worked with little or no waste, and I think must have been prepared with vegetable oil."

The above can scarcely be considered a fair test of the strength of this fibre, not only because the sample sent was too small, but because it was prepared from "stalks of an unlimited age." Mr. Sconce has been requested to forward another and larger sample prepared from the plants which are now under cultivation, the report on which will be furnished in a subsequent paper. It only remains to add in this place, that though the Society's museum is very rich in fibrous materials, it did not previously possess a specimen of the fibre of *Callicarpa cana.* In his treatise on substitutes for hemp and flax, already referred to, Roxburgh makes no mention of this fibre, nor does he allude in his *Flora Indica* to the plant possessing this property. From this circumstance it may be inferred he was not aware of it, as he never appears to have allowed an opportunity to pass of drawing attention to the useful properties of plants described by him, but on the contrary to have ever been desirous of rendering his botanical acquirements subservient to the dissemination of useful information in connection with every department of the vegetable kingdom.

Further remarks regarding the cultivation of the Mexican Cotton plant in India, and the proper season for sowing. By Dr. R. WIGHT, *Superintendent, Government Cotton Farms, Coimbatore.*

I send you herewith a copy of a circular I lately drew up for distribution among my friends in this part of India, and especially among our revenue officers, on the subject of Mexican cotton cultivation, having special reference to the sowing season. I am now preparing to give the plan as extensive a trial as possible in this district, especially in those portions which the American planters view as most unfavorably situated for the purpose. This I do the more readily, as a small portion of our last crop sown before the middle of June turned out exceedingly well, and produced the best cotton we have yet grown. As it happened, indeed, it was the only part of our crop that made a satisfactory return, that from the later sowings having been almost all destroyed by an unusually heavy and protracted monsoon. The beginning of October last, the promising appearance of our fields led me to anticipate a crop little short of 400 bales, which would have been equivalent to about 800 ℔s. per acre all over. If I now realize the half, I shall think myself fortunate. Enough has, it strikes me, been done to show that in cultivating the Mexican cotton plant as an extra tropical one, we have committed an error; as a review of our past operations, aided by the facts recently brought to light, seems scarcely to leave room for a doubt as to its tropical habits, and leads to the conviction, that treated as a tropical plant, every part of India is adapted to its successful cultivation. It is under this impression I am now urging a change in our plan of culture.

COIMBATORE: 16*th March*, 1848.

I regret that a pressure of duty prevented my sooner attending to your note of the 19th ultimo, the more so as I fear any seed I may now send, beyond a few banghy packets, will be too late for the June Steamer. Had time permitted, I should have sent you at least two cooley-loads to be forwarded by that quick mode of conveyance. Should such be your wish, I expect towards the end of the year, to be able to furnish any quantity you may require, and in the mean time shall forward some banghy packets to the care of the Secretary to Government, and request the favor of his forwarding them by the Steamer. I trust they may reach you in time, but fear they will be rather late for this season.* Those intending to give it a trial should get the ground ready in anticipation. We had some fine showers about the middle of April, and took immediate advantage of them to sow a field previously prepared. So far as it has yet gone, this first trial has proved very satisfactory in establishing the fact of the highly tropical character of the Mexican cotton plant, and in proving its capability of sustaining uninjured, even in its earliest stages, both drought and high temperature. Already the young plants are from 6 to 8 inches high, and most healthy, though for the last three weeks there has been no rain, and the thermometer, in the house, has ranged from 80° to 90°, with a clear cloudless sky. Several other fields have since been sown, all of which are doing equally well. From this beginning I anticipate the most favorable results; but, however they may terminate, I shall not fail to communicate them to the Society, strengthened, I trust, with many encouraging reports from other quarters.

* These packets did not, unfortunately, reach the Society before the middle of June; but no time was lost in dispatching them to various localities on this side of India; to Beerbhoom, Bhaugulpore, Chota Nagpore, Tirhoot, Gorruckpore, Benares, Allahabad, Lucknow, Banda, Cawnpore, and Agra, on the one side; and to Chittagong, Dacca and Gowhatti on the other: while a small proportion of the seed has been sown in the Society's garden.—EDS.

As regards the natural habit of this plant, it appears to thrive, though but sparingly supplied with water, but bears much rain during its growing season without injury to the crop, provided it has drainage, and clear warm weather at the season of maturity. On low wet ground it grows luxuriantly, produces largely, but the out-turn is rarely in proportion to the promise except in very warm and bright weather. Cold winds, or damp cloudy weather, at the season of maturity, I find most injurious; the former injuring its health, curling the leaves, and blighting the young flowers; the latter preventing or delaying the opening of the pods, thereby causing the deterioration of their contents, apparently through the retained juices acting on the fibre, and more or less completely rotting it in the pod. Clear warm weather, therefore, at the season of maturity, seems essential to the production of a crop of really good strong-stapled cotton, which it effects by the rapid evaporation of the moisture of the full grown pod, and causing it to burst before the contained juices have had time to injure the fibre. This fact should be kept in view in determining the sowing season, which should be, as far as possible, selected with a view to obtaining bright warm weather for harvesting the crop. In other respects the culture is simple enough—deep ploughing, liberal hoeing, and dry bottom.

COIMBATORE: 16*th May*, 1848.

"A subject of much importance, in connexion with the successful prosecution of the experiment now in progress for the naturalization of the Mexican cotton plant in India, namely, the proper sowing season, has recently engaged much attention, and has, in the course of its discussion, led to the promulgation of three distinct sets of opinions, more or less differing from each other. Two of these being easily submitted to the test of experiment, claim being subjected to that ordeal on a widely extended scale, though not on an expensive one, the more so as the results obtained, in the course of their investigation, must, almost unavoidably, decide the correctness or otherwise of the third. I now therefore address you for the purpose of soliciting your attention to a very simple experiment which, I anticipate, will go far towards, if it does not quite suffice to solve the problem now under discussion. But to place the matter before you in a clear and intelligible point of view, it seems necessary before stating my plans, to glance very briefly at the circumstances which have given rise to this application.

"2. The experiment, it is generally known, was commenced under the guidance of professional American cotton planters from the State of Mississippi, an extra-tropical province, lying between the 30th and 35th parallels of north latitude. These persons, on their arrival in India, were very naturally struck with the great difference of temperature existing between India and the region in which they had hitherto cultivated the Mexican cotton plant, and perhaps, from previous success in the cooler country, believing it to be a native of the high and cool table-land of Mexico, at once concluded, that the Indian climate was much too hot for its successful cultivation, except and even then but imperfectly, during the coolest season of the year. This opinion, which many circumstances which have occurred in the course of the experiment, has tended more or less to invalidate, they all still retain. No later than July last, Mr. Mercer, an excellent planter and very intelligent man, stated to the Manchester Commercial Association as his belief, that the growth of cotton in India, from New Orleans seed, must necessarily be limited, as it could only be grown in peculiar climates: that in the district of Dharwar it had found such a climate and succeeded, but that that was owing to the region of Dharwar having a mild climate: that in some portions of Candeish and Coimbatore having similarly mild climates, it equally succeeded in both places, but concluded that, as the extent of country so favored was upon the whole limited, Great Britain could only expect to derive a small proportion of her cotton, of that description, from India.

"3. About the time he was making these statements in England, I was engaged in drafting a letter to the Secretary to the Agricultural Society in India, which was read at the September meeting of the

Society, and immediately published in the Indian Newspapers.* In that letter I stated in effect, that it appeared to me, that what we had principally to attend to in the cultivation of the Mexican cotton plant in India, was not so much the heat of the seasons, as the adaptation of the sowing to the monsoons, so as to secure for the plant, during the rains, a growing season of from 12 to 16 weeks immediately preceding the period of bright sunshine, which usually succeeds on their discontinuance, for harvesting the crops which would then be attaining maturity. According to these views, the preliminary showers of May and latter end of September, which respectively usher in the SW. and NE. monsoons in regions under their influence, were indicated as the proper sowing seasons.

"4. Since that time I have been in correspondence with Mr. Jame Lees, of Manchester, a Member of the Commercial Association of that city, who has examined the subject in all its bearings, with the most elaborate care and attention.

"5. His first object was to establish the fact that the plant is truly of tropical origin, by showing that it is a Native of the *Tierras Calientes*, or hot districts of Mexico, lying under nearly the same parallels of latitude as the Indian Peninsula, and in many respects corresponding in climate. Secondly, that in its native country, where it naturally sows itself, it begins to vegetate with the rains in May and produces its crop in September, and that the cotton so grown in these hot districts is considered better than that grown from Mexican seed in the United States, however carefully cultivated: and lastly, he examined the practical results obtained in this and other countries where its cultivation has been attempted.

"6. The conclusions at which he arrives from this extended examination are, that the American planters have taken an erroneous view of the constitution and habits of the plant in supposing that it requires so cool or mild a climate, as they say it does, and that the views I promulgated are correct, only in so far as they relate to the countries under the influence of the SW. monsoon, but are erroneous as applied to those under the NE., because the natural growing season of the plant being during the summer months (May, June and July), he affirms we ought, in bringing it to India, enjoying seasons similar to those of its native country, to conform to its native habits, and, by sowing in May, secure for it in India as in Mexico, its natural growing season, and urges that it is only by following such a course, we need hope for success. In a word, he insists that the proper season for sowing Mexican cotton in India is at the same time that our ryots sow their spring crops of *cholum* and *cumboo*: which he enforces by adducing the fact, that in Egypt, where both crops are cultivated by irrigation, the Egyptian wheel can raise water enough to irrigate three acres of cotton, but only two of *cholum*, thence deducing the inference that cotton requires less water than *cholum* to perfect its crop, and consequently that the amount of rain that in India is found sufficient for the latter (which rarely fails), ought to suffice for the former.

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* See *Calcutta Star* 14th, *Madras Spectator* 27th September, 1847, and Journal of the Agri-Horticultural Society of India, Part 2, Vol. vi., page 118.

"7. 'By sowing at the natural time,' he observes, 'there would not only be more certainty of crop but other most important results would be obtained. The crop would at all times be much greater and the staple of the cotton much superior. These results would follow from a more perfect development of the plant. The observance of the natural sowing time will produce the most perfect development of which the plant is susceptible. It will then be sown at that period of the growing season when the soil and the climate are in the most heated state, and when this heat combines with those gentle showers, which at that time occur, to promote to the utmost the rapidity and vigour of the germination of the seed, and when also after germination has taken place, the subsequent growing season will be more prolonged and propitious than at any other period of the year.'

"8. Without, in the present state of our knowledge, venturing to go so far as to subscribe to these views to their full extent, I believe I am perfectly justified in urging as the least we can do, in return for the pains bestowed by the writer of these very able and elaborate letters, (of which I have only been able to give a brief summary, furnishing a very imperfect idea of the conclusiveness, as a whole, of the arguments adduced) is to institute over a wide range of country numerous comparative experiments. This I conceive may be done without trouble or expence: all that is required being to ask a few ryots in each district, when sowing their *cholum*, to sow a few handsful of Mexican cotton seed in any convenient spot in the same fields and watch the result. In this way the correctness or otherwise of the statement regarding the relative quantities of moisture required for perfecting crops of cotton and *cholum* will be established on a wide and satisfactory basis, and if found correct, may prove the means of at once introducing the culture of the exotic cotton into many parts of the country where it has not yet been heard of. But whether these first trials fail or succeed in districts under the influence of the NE. monsoon, the experiment should be repeated in October, for the purpose of ascertaining whether it is as certain and productive during the hot as the cool season, keeping the double object in view of confirming or refuting the opinions of the American planters regarding the necessity of a mild climate for its successful culture.

" 9. In confirmation of Mr. Lees' views, it seems but fair to state, that a large proportion of our crops has usually been gathered during the hottest months—March and April—that at these times the exotic seemed to bear the heat better than the native plant—and that, as regards the present season, the only fields which have as yet made a satisfactory return, were sown in May or the very beginning of June. The crops of all those sown after the middle of June, though equally promising on the 10th October, when the unusually abundant and protracted rains of this season commenced, have been nearly ruined. The plants however, apparently true to their natural habit of bearing during bright warm weather, have latterly greatly recovered their health, and are again in full bloom, promising as usual, a respectable crop—the season continuing clear and dry—in March and April. Samples of the May sown cotton, picked during very warm weather in September, have moreover been pronounced in England the best yet grown in India, another important fact in support of the same views.

" 10. In conclusion I beg again to state, that I think the least we can do, in return for the labor bestowed by our Manchester friend, is to set on foot, over a widely extended tract of country, the very simple experiments here suggested, lest, by failing to do so, we expose ourselves to obloquy on the ground of improper prejudice or obstinacy in neglecting to adopt measures fitted to decide a matter of the highest importance to the welfare of India. Those wishing to engage in these experiments can be supplied with seed from the farms, and as small quantities will suffice in the first instance for several such experiments, even the most distant stations might be supplied by means of banghy packets, in sufficient time for the approaching season.

"11. Reports, recording the results of the experiments are requested, and will be carefully examined, and a general summary, embodying the evidence furnished by the whole, will be published as soon as it can be completed.

ROBERT WIGHT, *Surgeon,*
Superintendent Cotton Farms."

COIMBATORE: *6th March,* 1848.

NOTE.—It did not occur to me, while drafting this Circular, that it was deficient in not supplying some criterion by which to estimate the comparative success or otherwise of the proposed experiments. The following particulars, extracted from the report of Mr. Mercer's statements to the Manchester Association, will partially remove the deficiency by providing some data for forming such an estimate:—

"In Dharwar, Mr. Mercer states, that the New Orleans cotton plant is small, only attaining the height of from 12 to 18 inches, and bearing on an average, only about 5 pods. The seed is therefore sown in rows, only 20 inches apart, and the young plants turned out to, I presume, from 12 to 15 inches from plant to plant. The aggregate produce of an acre so planted, is stated to be from 180 to 200 ℔s. of *kuppas* or seed cotton, which is found a remunerating crop.

"There is probably some error in the above figures, as I find by calculation, allowing each pod to contain only 50 grains weight of *kuppas*, that the aggregate amounts to somewhat over 400 ℔s. per acre, so that an average produce of 5 pods per plant may be considered a fair crop."

Observations on the failure of seeds of cereal grasses forwarded to the Society by the Court of Directors, and of the Oat and Carrot seed sent to the Stud Farms of the North-west of India. Communicated by Dr. ROYLE *in a letter to* J. C. MELVILLE, *Esq., Secretary to the Court of Directors.*

[Presented by the Government of India.]

In the accompanying letter from the Bengal Government, dated the 30th January 1847, a second application is forwarded from the Agricultural and Horticultural Society of India, for a further supply of agricultural seeds, in pursuance of the promise made by the Court to the Society in 1841, to send occasional supplies of such seeds as are deemed of importance by the most speedy conveyance.

The seeds last sent by the Court in 1845 were ordered from Messrs. Wrench, and were reported to have arrived in Calcutta apparently in excellent order, but like the many other consignments which the Society has received of seeds sent in large quantities, these failed, though no difficulty is experienced generally in obtaining even so delicate a seed as that of the *Deodar* by the overland route. On the present occasion it is taken for granted, that the failure is owing to the seeds of the previous autumn having been sent, and that better success would attend a consignment of the present year's crop to be sent by the August mail.

I fear that this course would not be attended with a more successful result, for the experiment has already been made by sending oat and carrot seeds to the stud farms, by the overland conveyance of the 19th June, in the same year that the agricultural seeds were sent by sea to the Society.

As I have already made some remarks on what I conceive to be the causes of the failure, I would beg leave to subjoin a copy of them, though they have already been presented in the Military Department.

I conceive the cause of failure to be the heating of the seeds from the mode of packing, and to their being sent at the hottest season of the year. The remedy I would suggest is, the sending of seeds in the *ear* or in *pod,* also to have them more closely packed, and in simple but thick wooden cases, and without any outer tin case. But instead of making such an experiment on a large scale, I would beg to be authorized to make three or four small experiments in different seasons of the year, and with the crops of different seasons I would send only a single box, packed as I have suggested at each time. If the experiment succeeds, it would afterwards require only a multiplication of their number, not an increase of their size.

East India House: *5th July,* 1847.

The oat and carrot seed sent by Messrs. Wrench for cultivation in the stud farms of the North-western Provinces of India, having failed, though sent by the Steamer of the 19th June, it is taken for granted, that this failure is owing to seed of the previous year having been sent, and it is suggested as a remedy, that seed of the present harvest should be despatched by the mail of the 20th of August, so as to reach India in time to be [illegible] at the central stud farms at the beginning of the ensuing [illegible]d season.

Without in any way deprecating the value of the fresh seed, it must however be observed, that it is extremely difficult to ascertain with certainty the true causes of the numerous failures which have taken place in the transmission of seeds sent in bulk to different parts of India, both by the Egyptian route and by that round the Cape of Good Hope; by this observation I allude to the several attempts made at considerable expence by the Agri-Horticultural Society of India to obtain fresh seeds from England, both of cereal grains and of the ordinary kitchen vegetables.* In these experiments the result has been, that seeds from England sent in bulk, have usually failed, while those from North America have often succeeded; also, that success has very generally attended those imported from the Cape of Good Hope. The temperature of the season during which the seeds have been ripened, has probably some influence upon the germination of the seeds in a country like India, where the season of sowing being at the beginning of the cold weather, the temperature both of the earth and air is a gradually *diminishing* one, while in England that of both is on the contrary, a gradually increasing one; but this cause ought to affect all foreign seeds alike.

With respect to the freshness of seed, or rather to the seed sent having been that of the previous harvest, I would remark, that though there is no doubt of the superiority of the freshest seed, yet carrot seed, of the best quality, is frequently found to fail even in this country, and that oats, which have been stocked for two or three years, will vegetate nearly as freely as fresher seed.

It appears to me, that failure is to be ascribed to the detriment sustained by the seed during transmission to India rather than to any original defect. In the first place I conceive, that the mere sending of seed in *bulk* is injurious from the *heating* which must necessarily take place, and which is observed to occur even in granaries of small extent in this country. This natural *heating* must necessarily be greatly encouraged during transmission in close, often tinned boxes, along the Mediterranean, down the Red Sea and across the Indian Ocean, especially as the transmission of seeds in bulk has always taken place during the hottest time of the year, when even the cabins of the steamers are described as being intolerably hot, and the close place into which the seeds are placed along with the other packets must be much more so, and the seeds, as observed to me by Dr. Wallich, "must be very very sound, very strong, and very fresh, not to perish." In the transmission round the Cape of Good Hope, the seeds usually enclosed in the tin cases and placed in the hold of the ship, where there is necessarily great heat with moisture, and sent round at the hottest time of the year, will be subjected to successive heatings and coolings in twice crossing the line and once rounding the Cape. Seeds however are sent to and received from India by the Egyptian route, and vegetate freely. For instance the *Deodar*, which is as difficult of transmission as most others, is now received in considerable quantities, but in moderate packets, and vegetates so freely that the country will be covered with forests of *Deodar*: so also cuttings of fruit trees have been sent to Dr. Jamieson at Seharunpore, and have been reported upon by him to have arrived as fresh as if they had just been cut off from their parent trees, and several of them have produced fine healthy plants in the Mussooree garden. These transmissions of cuttings however succeed only in the winter season of this country, and the cold weather of India. As I do not despair of eventual success, notwithstanding the numerous failures, I would suggest a number of small experiments being made in different ways, so as to ascertain, if possible, the causes of failure, and then determine upon the mode of insuring success in future.

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* It is worthy of remark, that the last consignment of *flower* seeds received by the Society by the overland conveyance, in October 1847, germinated most freely. It consisted of an assortment of the *latest* gathering, and most of the varieties were scarcely two months old at the period of sowing. One-half the consignment was subdivided by the Seedsman (Mr. Carter of Holborn), the other was despatched *in bulk;* both proved equally good. The boxes were lined with tin, and made air-tight by careful soldering. Previous consignments of flower seeds from England had generally caused disappointment, and this is attributed to their having been despatched earlier in the year than the month of August, thereby involving the necessity of sending seeds of a former season's gathering.—Eds.

1st. I would recommend that oats, wheat and other grains, intended for seed, should be sent in the ear, (or in their seed vessels) and not after they have been threshed out.*

2nd. That all seed, sent for such purposes, should be loosely packed in thick deal boxes and without tin cases, and not be allowed to be put into the hold of a ship or steamer.

3rd. That seeds of cereal grains should be sent, thus packed, at different seasons of the year, so as to ascertain the effects on them of the temperature experienced in transmission during the different parts of the year.

4th. That the seed of cereal grains, &c., which ripen the earliest this year, should immediately be transmitted to India, and if possible, as requested, by the steamer of the 20th August. But as it is possible that it may arrive too late for sowing in all the stud farms, I would recommend a portion of it being tried in the Himalayas early in the spring, so as to ascertain vegetative powers, and if possible, obtain a crop for sowing in the subsequent autumn in the plains of India.

Some of these experiments, I propose, carrying on through the Botanic Garden at Seharunpore, which is in the immediate vicinity of one of the studs.

(Signed) J. FORBES ROYLE, M.D.

EAST INDIA HOUSE:
10*th May,* 1847.

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* The result of a trial on cereal grain and other seeds, sent in accordance with this suggestion, will be found at page 145 of this number, in the department of correspondence and selections.—EDS.

Observations on the indigenous Cotton of India.

By J. G. Bruce, Esq.

I beg to enclose a copy of a letter which I wrote in March last, in reply to two I received on the subject of the indigenous cotton. The object of my troubling you is to solicit the favor of your procuring for me the insertion of it, along with my present letter, in the Transactions of the Agricultural and Horticultural Society, that their publication may be the means of attracting the notice of the Government, as well as of the associations and manufacturers in England, who have been memorializing and urging the authorities for an increased cultivation; and its becoming known that there is one in India, who is willing to undertake to procure for them, as much real, good, merchantable cotton, either American or indigenous, as they may require—after the second year, if it be the American,—and immediately, if it be the indigenous, and not to cost them when landed in England, the former, more than about an average of 4 or 4½*d.* per ℔., and the latter 3 or 3½*d.* per ℔., which I think very moderate, considering that the American cottons generally realize in England from 4¾ to 7¾*d.* per ℔. and the indigenous from 4½ to 5½*d.* per ℔.

In December 1844, I offered to have 1,000 beegahs of the American cotton cultivated in Bundelkund, *at my own private expence,* to show the Government of the North-western Provinces,—provided, I was supplied with 125 maunds of seed from some of its experimental farms then existing, and removed to Calpee,—the practicability of the successful introduction even of the American cottons. My object was simply to prove at my own cost, the feasibility of the thing, through the agency of the landed proprietors and cultivators of the soil. Had my proposition been patronized, the result of my experiment of 1,000 beegahs, I had sanguine hopes, would have shown not only the uncertainty but the expensiveness of the "*Neej,*" or home cultivation system, unsuccessfully adopted at the Government experimental farms. Unfortunately I could not obtain the seed from any of the Government farms. You must recollect that I afterwards applied through you on the 31st of January 1845, to the Agricultural and Horticultural Society of India for the seed, offering to pay for it, but what was kindly placed by one of its members at the disposal of the Society on my account, proved bad, on trial by the Honorary Secretary. Had I succeeded in my application and obtained the seed, I calculated the first year's cultivation of 1,000 beegahs would have afforded me acclimated seed enough in the succeeding year to cultivate 26,000 beegahs, and in the third year probably sufficient to sow 533,000 beegahs, yielding, I had every reason to expect, a produce of 130,000 bales of cotton, averaging in weight 336 ℔s. each. The latter part however of the speculation, namely, that of the 2nd and 3rd year, I could never have thought of embarking upon on my own account.

The success of my first year's adventure, I had no doubt would have induced the Indian mercantile community, through the recommendation of my Calcutta friends, to support the continuance on their account of my two subsequent years' contemplated experiment.

In conclusion, permit me to beg the favor of your endeavouring to procure for me 125 maunds of good American cotton seed, to enable me to commence operations in May and June 1849. I will be happy to remit to you its amount, as soon as I hear that you will be able to secure the seed for me, at the period I shall require it. I shall of course, *pro bono publico,* keep you informed from time to time of the progress of my cultivation, for insertion in the Transactions of the Agricultural and Horticultural Society of India.

CAWNPORE: 31*st July,* 1848. J. G. BRUCE.

To R. Lowther, Esq., *Commissioner at Allahabad.*

Sir,—I have the honor to acknowledge the receipt of your letters, No. 8 of the 28th ultimo, and No. 9 dated the 6th instant, the first transmitting a copy of one from Mr. Secretary Thornton to the address of the Sudder Board of Revenue, N.W.P., and requesting that I would furnish the information called for respecting the extent to which India is capable of supplying cotton in the event of an increased demand for it: and the second transmitting a copy of the letter No. 75, from the Secretary to the Government of India, Home Department, dated the 15th January last, and of the enclosure which accompanied it, respecting the information required by the Hon'ble the Court of Directors, regarding the quantity of cotton produced in India.

2nd. Having been employed at the late Commercial Residency of Etawah and Calpee, from its first establishment in 1808, till its dissolution with the cession of the Company's trade in 1834; and having, on the abolition of the Residency, been engaged myself extensively for four years subsequently in the purchase of cotton on my own account, as well as on commission for several agency houses in Calcutta; and having been accustomed to form and submit one general estimated average of the cotton intended for consignment to the London and China markets, upon the prices annually prevailing at the several marts in the North-western Provinces, I am humbly of opinion, it would be more to the purpose to reply in the same manner to the queries propounded by the Hon'ble the Court of Directors, than were I merely to confine my information to any one single district or mart.

3rd. I have the honor to annex below, my replies opposite to the queries contained in the dispatch of the Hon'ble the Court of Directors.

I. "What is the price of cotton freed from seed, at the principal mart or marts in your district?" The price depends principally upon the demand and produce. In an average season however, cotton, at the place of produce fit for the London market, may be estimated at Co's. Rs. 7 per maund of 80 Co's. Rs. to the seer, equal to 14 shillings for 80 ℔s. The cotton fit for the China market may be estimated at one rupee less per maund.

II. "At what price does the ryut sell his cotton, cleaned or uncleaned, and with or without advances?" The ryut, who can manage his cotton cultivation without the aid of an advance, realizes about 6 rupees a maund of the seer of 96 Co's. Rs. for his clean cotton. The poorer classes of cultivators, however, have little concern with the sale of their cotton. After the seed is sown at the commencement of the periodical rains, they require the aid of the village *bunneeas* or bankers to enable them to weed, and to attend to their cotton and other crops; which, from the time the assistance is granted, become in a manner mortgaged to the *bunneeas*, at least they have the entire disposal of the produce. Owing to this circumstance, the *kuppas*, or cotton with the seed, as it is gathered, is made over to them, who separate the cotton from the seed, and sell it to re-pay themselves. The cultivators in this case seldom realize more than rupees 4 and 8 annas for their maund of clean cotton.

III. "What is the expence of cleaning cotton by the *churka* or foot roller, or by any other method which may be in use?" Properly speaking, the separation of the cotton from the seed in this country costs nothing, whether the work is performed by the cultivator, or the person to whom he sells it unfreed, the price the seed realizes when sold, more than covers the amount of labor.

IV. "What are the expences of conveying cotton to the nearest port for shipment?" Including the expence of cleaning and screwing the cotton, gunnies and other packing materials, boat-hire, export duty, and every thing else, an average of about Co's. Rs. 2 and 3 annas per maund of 80 Co's. Rs. to the seer, to Calcutta from the place of produce.

V. "What is the average produce of cotton per beegah or acre?" Generally a maund per beegah, of the 96 Co's. Rs. to the seer, or 2 maunds 8 seers the acre, where the cultivation is properly attended to.

VI. "What is the quantity of land under cultivation with cotton and to what extent is it probable that the cultivation could be carried, in the event of an increased demand? N.B. The beegah, maund, and rupee used, in answering these questions must be defined." In the year 1818, the largest quantity of cotton, vide my address to you of the 2nd April, 1846, was exported by sea from Calcutta, viz., near 12,00,000 maunds, we may therefore, I think, safely calculate, upon an equal quantity having been produced and retained in that year, for the consumption of the North-western Provinces as well as Bengal. If my data be tolerably correct, there must have been about 24,00,000 beegahs of land under cotton cultivation in that year. What it may now amount to, must be considerably less, but to what extent it could be carried, in the event of an increased demand, it will not be difficult to tell.

4th. Having replied to the questions in the dispatch of the Hon'ble the Court of Directors, I shall now proceed respectfully to offer a few more general remarks on the same subject, which my experience and recent enquiries of native wholesale dealers in the article, suggest.

5th. You must have observed during the last twelve months, how strenuously the Hon'ble the Court of Directors, the Board of Control, and even the House of Commons have been memorialized, urged, and solicited by the Liverpool, Manchester, Lancashire, Hull and other commercial and manufacturing associations, regarding the increased cultivation of cotton in India.

6th. From the purport of these memorials, as well as the remarks of the press in India, the real merits of the question appear to be wholly misunderstood. I beg leave to observe, that on this side of India, neither the land-tax nor the transit dues are tremendous, as asserted by the Calcutta press; nor do they amount to any thing like 75 per cent. on the average value of cotton, as represented by the *Hull Advertiser*. What they may be at Bombay or Madras I cannot exactly say, but I am inclined to suppose, far from what they have been designated. All the amelioration that would be required, it appears to me, would be to place the Bundelkund cotton, and the produce of the right bank of the Jumna generally, upon the same footing as that of the Dooab, namely, to levy the duty on the exportation of the cotton from Calcutta. The evil of making the Bundelkund cotton and that of the right bank of the Jumna, pay the duty before it can be boated, is in fact a tax upon the land under cotton cultivation.

7th. If the associations and manufacturers, who have been memorializing and soliciting the authorities in England, regarding the increased cultivation of cotton in India, actually wish for it, and will guarantee that all that may be produced through my exertions in this country, will be taken by them, and paid for here, and will send out responsible agents to receive charge of the cotton, either here or at Calcutta, I will engage and undertake to produce for them, as much real, good, merchantable cotton as they may require; and not to cost them, when landed in England, more than about 3½*d.* per ℔., which I think very moderate, considering that Indian cotton generally realizes from 4½*d.* to 5½*d.* per ℔. in England.

8th. The decrease of cultivation everywhere in India, may be ascribed solely to the want of a demand for the article. If the Government, even through the means of advances to the cultivators, increased it, to meet the solicitations of the associations in England, I apprehend, that as soon as those advances ceased, the culture would again revert to its former standard, owing to the poverty of the landholders and ryuts.

9th. If the associations be of opinion, that the indigenous cotton, of a good staple and quality, be desirable at my estimated average of 3½*d.* per ℔., the most eligible plan, it appears to me would be, to purchase it through the *Beoparries*, or native cotton merchants, as was done before for the Company, when they traded in the article, and to leave the *Beoparries* to get it from the cultivators, as they formerly did, and now do, to the extent of their wants, through the village *bunneeas* or bankers. If the native merchants found the speculation advantageous (very little indeed satisfies them), they would, I am sure, take proper measures to encourage the cultivators. By the adoption of this plan, cotton of an uniform good quality may readily be obtained from every part of the North-western Provinces, through the native cotton merchants, without the risk of incurring balances. If the half of the amount of cotton which is now used in England was thus transferred to India, it would not only do the country an immense deal of good, but yield the Government an export duty of 55,00,000 Rupees.

(Signed) J. G. Bruce, *Deputy Collector.*

Cawnpore: 15*th March*, 1848.

Correspondence and Selections.

RISE AND PROGRESS OF THE BHAUGULPORE BRANCH AGRICULTURAL, HORTICULTURAL, AND FLORICULTURAL SOCIETY.

(*Communicated by Major* T. E. A. NAPLETON.)

In the early part of April 1843, a suggestion arose as to the expediency of establishing an Agri-Horticultural Society at this station, as the soil and climate appeared particularly adapted for such an undertaking, and with this view a meeting of the residents of Bhaugulpore and its immediate vicinity, both European and native, was convened on the 11th of the same month, for the purpose of ascertaining how far such an object was in unison with the wishes of the public.

The meeting was most numerously attended, and fifty-two subscribers gave their support to the proposed institution.

It was next voted, that a public experimental garden be immediately established, and that a piece of land opposite Cleveland house, of twelve beeghas (which in Mr. Cleveland's lifetime formed part of his splendid estate) be selected and purchased for the purpose. The purchase was very shortly concluded at Rs. 40 per beegha, whilst a crop of indigo was growing on it, and a suitable establishment was entertained for commencing operations and clearing the land. Donations for the purchase of the land were solicited, and the call was responded to with much liberality.

Major T. E. A. Napleton was appointed Honorary Secretary, and he was requested to undertake the laying out and management of the public garden.

It was also decided, that the monthly subscription should be Rs. 1-8-0 or 18 Rupees per annum, and that a donation as entrance money should be left optional with intending subscribers. The following propositions were put and carried *Nem. Con.* That the chief object in forming this institution be for the improvement of agriculture and horticulture in all its branches. That the Agri-

Horticultural Society of India be solicited to enrol or consider us a branch of the Parent Institution.

Several packets of melon, lucerne, coriander, onion, beet, capsicum and clover seeds brought from Cabool by a member of the society were presented to it for the purpose of being sown in the new public garden, and a letter was written to Messrs. Vetch and Co., Exeter, Devonshire, for a fine supply of seeds for the October sowings.

The next step in advance was, the expression of a wish on the part of the subscribers, that an exhibition of flowers, fruits, vegetables, &c. should take place on the 10th of the ensuing month of May, for the purpose of ascertaining what the produce of the gardens at the station consisted of, and what cereal and other grains were grown in this district. The result was, that floriculture was found to be almost in its infancy, with the exception of one or two gardens; the vegetable department was somewhat more advanced, the fruits excellent, but the cereal and other grains of the very poorest description with a very few exceptions, and it is worthy of remark, that some fifty *dallees* from the gardens of the native subscribers consisted wholly of indigenous specimens.

The show was exceedingly well attended, indeed crowded, and the most lively interest appeared to be taken in every thing connected with the object for which the show was held.

The sum of Company's rupees 41 was distributed in prizes.

It was on this occasion decided, that the earliest opportunity be taken of introducing into the district from foreign countries, other districts, Cutmandoo and Darjeeling, seed of cereal grains for the purpose of being acclimated in our public garden, and then distributed to the zumeendars and other agriculturists, and it was, with a view of carrying out such an important measure, resolved, that a piece of ground suitable to agricultural experiments be allotted. Seventeen new subscribers were added to the list during the month of May.

From this period up to the 1st November following, the formation of the public garden was most industriously carried on. The clearing of the ground, levelling it, making serpentine, diagonal, and other walks, sinking wells, the erection of temporary sheds for the gardeners, and garden implements: the purchase of bullocks, hackeries, &c. Application was made to Dr. Wallich, Superintendent of the Honorable Company's Botanical Gardens for plants, who immediately met our wishes with much liberality, and expressed his willingness to render further assistance whenever required.

On the 15th of November an examination of the accounts of the Society took place in the public garden, prior to an horticultural exhibition the same evening. It was most gratifying to find that the list of subscribers on this day numbered 111, and the amount of donations for the purchase of land, &c. for the public garden 1178 rupees. The districts of Purneah and Monghyr gave their support in the way of subscribers most handsomely.

Dwarkanath Tagore, Esq., visited our garden in September, and gave a donation of one hundred rupees in his usual munificent style of supporting useful institutions.

Two silver medals and the sum of fifty rupees were received from the Parent Society, with an intimation that a similar donation would be presented annually to our Branch Society.

Now come the receipts and disbursements.

Memorandum.

Amount of monthly subscriptions to the 30th of November, 1844, ...	1,159	0	0
Amount of donations up to the 30th of November, 1844, ...	1,175	0	0
Total, Co's. Rs... ..	2,334	0	0
Expenditure up to the 1st of Nov. 1843,..	2,255	0	0
Balance in favor of the institution on the 1st November 1843, ...	79	0	0

G. F. Brown, Esq., was the Chairman at this Meeting. The accounts were approved of and passed.

It was then proposed by E. F. Reade, Esq., Civil Service, and seconded by Dr. Leckie, that the thanks of the meeting be offered to the Honorary Secretary for his indefatigable exertions in planning and laying out the garden, and bringing it into its present flourishing condition.

The Honorary Secretary gave notice that the extra sum of two hundred rupees was much required for the completion of work in hand, upon which the Chairman addressed the meeting in the following words :—

" GENTLEMEN,—Though it may not be considered quite regular for the Chairman of a public meeting to move any resolution for general adoption, yet I hope you will hold me excused for doing so on the present occasion. You have just passed a vote of well merited thanks on our indefatigable Secretary, but I wish you to do something more than this: I wish you to prove by deeds, not words, how grateful you feel for his meritorious exertions.

" You all know that a year ago, such a society as this was never thought of at Bhaugulpore, and that six months ago, our present flourishing public garden was an indigo field.

" Within this short period, the ground has been purchased and cleared, walks have been made, wells dug, show-rooms built, trees planted, flowers of all descriptions brought from Calcutta, potatoes from Futtyghur, cotton from the east, tobacco from the west, and all sorts of varied and valuable seeds from England. For all this, I tell you again and again, we are indebted to Major Napleton.

" But more than this. We owe it to Major Napleton's zeal, constant supervision, and good management, that twice as much has been effected with the money which we subscribed towards the undertaking than we could reasonably have expected. He has made rupees 500 go as far as another would have done rupees 1,000. Now then, as it appears that some little matters are wanted in order to complete the object which Major Napleton has in view, I think that we cannot better show our gratitude to him for his valuable services than by making up the small sum required for the purpose. A few rupees from each subscriber will be sufficient, and will be the best proof we can give of our rightly appreciating Major Napleton's successful exertions."

The sum asked for was at once subscribed.

It is proper to note, that a supply of very fresh seeds was received per overland route during the month of November, from Vetch and Co., of Exeter.

The meeting then broke up, and those who composed it proceeded to the show-rooms, where the ladies of the station and a great number of visitors were assembled.

The show-room presented a very pretty appearance, and the samples of vegetables and bouquets of flowers for this early part of the season were very creditable.

The silver creeper and *Yucca gloriosa* were in great beauty, and the *Hastingia* in company with them, formed a beautiful contrast of colors. The first and third are indigenous to the jungles near this.

It was truly pleasing to see the native subscribers, their children and friends who accompanied them, taking their seats to witness the competition for prizes. At first they were reluctant in sitting down before the *sahib log*, but on being assured that they were assembled to do honor to, and promote the cause of agriculture and horticulture, and from the circumstance of their being fellow-contributors to the garden in which they then were, their scruples were overcome. Several of the gentlemen entered into conversation with them, and pointed out the ulterior benefits likely to accrue from Agri-Horticultural exhibitions of this nature. It would take up too much space to go into a detail of the products brought forward for competition; suffice it to add, that 46 rupees were awarded in prizes.

Thus ended the first show in our public garden.

Another show took place on the 28th December, and continued improvements in all departments were evident, and the sum of 40 rupees was awarded in prizes.

At the commencement of a new year it is but natural that this Branch Society should say a few words in allusion to the past one. On New Year's Day no less than 116 subscribers were borne on the rolls, and the money donations amounted to rupees 1,489.

The projectors of the institution cannot refrain from recording the satisfaction they have derived from the great support they have received from the European and Native community, and it would be ungrateful to omit the mention of the names of the following gentlemen as contributors of plants, seeds, &c.

Dr. Wallich; Dr. Griffith; G. W. Bartlett, Esq.; Dr. Campbell, Superintendent of Darjeeling; Dr. Pearson; G. F. Brown, Esq.;

J. Pontet, Esq.; Muddun Tackoor; W. Vansittart, Esq.; Capt. Don; Walter Landale, Esq.; C. H. Barnes, Esq.; R. F. Hodgson, Esq.; G. W. Brown, Esq.; Major Napleton; E. Lautour, Esq.; J. Piron, Esq.; J. Glas, Esq.; J. Oman, Esq.; J. H. Savi, Esq.

On the 3rd of February 1844, another exhibition of vegetables took place, at which an immense assemblage of subscribers and visitors were present.

The show-room was full of *dallees.* From the gardens of European subscribers, English vegetables of all sorts were to be seen. Cauliflowers from English seed, 46 inches in circumference, celery, cabbages and nohl-kohl of sorts, carrots, beet-root, peas of sorts, salad, &c. &c., and it is worthy of notice, that numbers of *dallees* brought from the gardens of the Natives contained fine specimens of English vegetables.

It was on this occasion decided, that as the *rubbee* crop would be harvested by the first week in May, an exhibition of agricultural produce be fixed for the 7th of that month, when two silver medals and some prizes in money would be contended for. The show came off accordingly on the 7th May. About 70 members, besides visitors, attended, and the samples of grain covered 20 large tables.

The umpires, G. F. Brown, G. W. Battye, P. Onraet, Esqrs., Baboo Gooroo Churn Mitter and Muddun Tackoor, after a careful examination of the specimens, awarded a silver medal to C. H. Barnes, Esq., of Colgong, for the finest samples of wheat and barley. A second medal was awarded to Major Napleton for the best potatoes, tobacco, white gram, &c., the honor of receiving which he declined in favor of the native zumeendars, and it was accordingly awarded to Rajah Oodit Narain Sing, of Aulumnuggur, for the best sample of oats and 2nd best wheat. A money prize of 6 rupees was awarded to Muddun Tackoor, Zumeendar of Kulan, for some excellent samples of wheat and barley. A money prize of 3 rupees was awarded to Muhasha Omanauth Ghose for mangul wurzul.

The cultivation of the potatoe has been carried on with immense success during the last six months. Four potatoes reared from Cherra Poonjee seed weighed 77 rupees: five potatoes from Darjeeling seed weighed 80 rupees. The introduction of mangul wurzul into the district will no doubt (when the natives become fully sensible of its value as an article of food for their cows and cattle,) be highly appreciated.

It is not the wish or intention of the present Garden Committee (under whose auspices this report of the Bhaugulpore Branch Society's progress from year to year, is preparing) to enter too much into detail, but to notice eventful occurrences, and such as may prove agreeable in their perusal to those who take an interest in the subject, which these few pages occupy in the Journal of the Agri-Horticultural Society of India; and be it not supposed for a moment, that we should have brought the affairs of our institution thus prominently to public notice had not the Parent Society done us the honor to express a wish to see the result of our humble endeavours committed to paper.

A meeting for the inspection of accounts, &c., was held in July, 1844, which found our Branch Society free from debt, notwithstanding the expensive operations which must necessarily attend the formation of a new garden, a garden too, which is eventually intended to be a botanical one.

On the 19th of November of the same year, a horticultural exhibition took place.

Every improvement that could be described in the floricultural and vegetable departments was developed in the mass of beautiful specimens brought to the show-rooms. It is proper here to note, that the products of the public garden are not allowed to compete for prizes, but on this occasion the improvements in the baskets of vegetables and bouquets of flowers were so satisfactory, that the umpires voted that a handsome present should be given to the Society's gardeners as an encouragement to still greater exertions.

The sum of money required was subscribed for at once and given to the *malees.*

We must now close the year 1844, with the following brief remarks:

Nine beeghas of ground were added to the public garden, and a tank of fine size commenced on; which, being bounded on the north by the public road leading from Monghyr to Calcutta, will eventually furnish a fine supply of water for travellers, besides being a great ornament to the public garden. The Magistrate Mr. E. Lautour, seeing the vast deal of public good which would accrue from the completion of such a tank, most kindly gave convicts to assist in excavating it, attended himself frequently, and marked out its limits. The European and Native community subscribed very handsomely (some 500 rupees) to this undertaking, and the Superintendent of Police assisted us with 200 rupees also.

Two *ghats* were constructed with 28 pucka steps to each, and before the year closed all was finished.

The number of subscribers on the roll on the 31st December was 156.

It is with the greatest pleasure we now make known, that the Hon'ble Sir L. Peel, the great and liberal patron of Agriculture and Horticulture, became a subscriber to our Branch Society, during the year 1844, not on 18 rupees per annum, the regulated subscription of the institution, but on the munificent sum of one hundred rupees a year. From the Parent Society we received six sorts of American maize seeds, Cuba and Bhilsa tobacco seed, two cases of English fruit trees, Nerbudda wheat and white linseed, a fine supply of vegetable seeds, with two silver medals and 50 rupees. Also plants and seeds from Drs. Griffith and Wallich, Superintendents Hon'ble Company's Botanical Gardens, The Hon'ble Sir L. Peel, the late C. K. Robison, Esq., the Messrs. Wood, Dr. Campbell, Superintendent of Darjeeling, G. W. Bartlett, Esq., Captain Hockly, Syud Zain Ooddeen Hoossein Khan, the Hon'ble Sir G. Pollock, A. Parker, Esq., and Dr. Christie, Kutmandoo. Can we do less than express our grateful acknowledgments to our subscribers and donors for thus liberally supporting our institution? and, under such cheering prospects, it is not unreasonable to predict, that the eventual success of the undertaking may, in some measure, compensate them for their able support.

Now commences the account of our progress in 1845.

Agri-Horticultural exhibitions took place on the 16th of January, the 12th of April, the 30th of May, and 15th of November. The most remarkable events in this year are as follows:

The addition of thirteen beeghas of land to our public garden, the erection of several buildings, the lengthening of the tank 80 feet, and the construction of a beautiful ghat on stone pillars to the eastward, which James Young, Esq., our Magistrate, designed with great good taste, and in all these improvements assisted us with convict labor, until an order from Government interdicted prisoners being employed in public gardens.

In the floricultural, vegetable, fruit and agricultural departments, the continued improvements were highly commendatory, particularly in the introduction of many new varieties of cereal grains, flowers and vegetables. Our subscribers at the close of the year numbered 210.

Rajahs Bejagobind Sing and Roodranund Sing Bahadoor, presented our Branch Society with 100 rupees each, on becoming members. The sum of 113 rupees 6 annas was realized by the sale of vegetables, and the accounts being examined at a public meeting on the 14th November of this year, a balance in favor of the institution of 416 rupees was exhibited, which was pronounced very satisfactory. The Honorary Secretary at the same time reported, that the seeds received for this season's sowings had not turned out well in consequence of having been stowed by our London Agent in a bad part of the hold of the ship which brought them out. From the great heat of the hold the seed had sweated and caked.

Two silver medals were in May awarded as follows:—

One medal to George Barnes, Esq., Colgong, for some very fine specimens of wheat, white gram, barley and oats. The samples were the produce of the Ekdara and Colgong zumeendarees conjointly.

The second medal was awarded to Rajah Oodit Narain Sing, of Aulumnuggur, for the best white linseed, American cotton, oats, &c. It is worthy of record here, that two of the zumeendars of Tirhoot sent samples of cereal grains to the show. In the agricultural department some money donations were presented to three native agriculturists, for fine samples of potatoes, cotton, safflower, peas, tobacco, &c. &c.

We cannot close this year without noticing the great additional number of subscribers from the Tirhoot, Rungpore, Gyah, Goruckpore, Beerbhoom and Bhaugulpore districts, and in taking leave of it we sincerely thank our supporters for their liberal aid in forwarding the interests and welfare of our Branch Society.

The first occurrence in the year 1846 we have to notice is an exhibition of vegetables, fruits, flowers, &c. on the 30th of January.

This was the finest show hitherto seen in our public garden, and room for the vegetable *dallees* not being available in the show-rooms, they were laid out under a mangoe grove close by. The floricultural specimens were arranged with taste in the show-rooms, as also the fruit.

The following opinion of the umpires relative to the produce of the public garden will show at once what improvement had taken place since last year:

"We are of opinion, that the show of vegetables and flowers exhibited this day in the public garden, excelled, it is believed, any thing of the kind ever seen in India, and would vie with the best productions of Covent Garden in point of size and quality, as will be proved by the weight of the articles specified below, reflecting the greatest credit on Major Napleton, the Honorary Secretary, for his zeal and skill in producing such a magnificent show of first-rate vegetables, flowers and exotics, from what was a short time since a common indigo field.

"The taste and skill also displayed in laying out the garden, and the fine order in which it is kept, is beyond all praise, and excited the admiration of thousands assembled to view it.

"It is hoped that this laudable example will be followed at every station in India."

(Signed) C. B. QUINTIN. (Signed) J. MACCALLUM.
,, R. BARNES. ,, F. GOULDSBURY.

Memorandum showing the weight (eighty Siccas to the seer) of some of the public garden vegetables.

Celery.—One stick weighed 3 ℔s. 10 ounces, and was finely blanched: another stick weighed 2 ℔s. 10 ounces, and was finely blanched.

The oldest residents in India present at the show, were unanimous in declaring the celery exhibited to be far the finest ever seen by them in India, and perhaps never surpassed in Europe.

Beet-root.—Two pieces of beet-root weighed 4 ℔s. 10 ounces.

Potatoes.—Four potatoes from Cherra Poonjee seed weighed 3 ℔s. and it has been most satisfactorily ascertained that the Cherra potatoe is superior in flavour and more productive than any other grown in India, with exception of the Darjeeling, which after being acclimated at Bhaugulpore, is a wonderfully good potatoe, with a skin as fine as silk, and in color delicately white.

Onions.—Four Onions from acclimated Cabool seed weighed 3lbs. and 5 ounces, and were beautifully white in color.

The *dallees* from private gardens of the European and Native community were of a very superior description.

Some splendid exotics were to be seen amongst the flowers from the garden of R. F. Hodgson, Esq., of Monghyr. Prizes to the amount of 57 rupees 12 annas were awarded. The concourse of respectable Natives in attendance at this show was enormous, not less than four thousand. * The umpires awarded a month's pay to each of the sirdar mallees.

Floricultural department, ...	7	0	0
Vegetable department, ...	6	0	0
Agricultural department, ...	6	0	0

The next thing worthy of notice in this year is the introduction into the public garden of the West India arrow-root. Dr. Stuart of Kunjurpore, most obligingly presented the Society with a lot of roots or tubers, and their cultivation was commenced with much care at the commencement of the rainy season, and yielded a fine crop in the cold weather. Swampy ground was fixed on for the experiment, and the result fully taught us that we had not erred in doing so. We shall refer to this subject again by and bye.

The grafting of mangoes on seedlings from the finest Bombay trees was carried on with great success this year; the parent trees, 45 in number, having become available for the above purpose in an orchard on the Cleveland house gardens. Leechee *untas* were also made: loquats grown from seed: coffee plants planted out, and in the account of the last year we omitted to mention the introduction of a fruit tree into the garden called the sapota.

The Rajas and Zumeendars in these districts think no garden perfect or complete that has not this fruit tree in it. The foliage is very pretty and ornamental. The fruit itself round, and brown in color, and nice tasted, and would form a handsome desert fruit. The above description of the fruit was given us by Maharajah Bedanund Sing Bahadoor, of Purneah.

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* Exclusive of children, gardeners, servants and the like.

In June our agricultural exhibition took place, and it was most gratifying to see realized the looked-for improvement in cereal and other grains, &c.

The Nerbudda wheat, white linseed and white gram, attracted much notice. The former has been extensively cultivated in farms far and near. Walter Landale, Esq., of Luttypore, an enterprizing agriculturist, imported 50 muns of Nerbudda wheat at the last sowing season (October), and distributed no small portion of it. The produce of that gentleman's farm ranked No. 1 in the show, which circumstance it is hoped proved some reward for his zeal in so good a cause. Finer wheat could not, it is believed, be met with in any country. The awarding of medals however, depended on the greatest number of best samples (not one sample) of all sorts of grain from one farm, and the umpires after testing all, most carefully decided that Rajah Oodit Narain Sing, of Aulumnuggur, was entitled to a silver medal for two best samples of wheat, one of barley, one of oats, one of white gram, one of safflower, and one of tobacco.

This medal was open to the competition of Europeans and Natives, and the winner of it just named, when the medal was delivered to him, was complimented on his success. A second medal which was open to the competition of Natives only was won by Baboo Gooroo Churn Mitter, of Bhaugulpore, who has ever taken the greatest interest in every thing tending to improve the condition of his countrymen, and is much respected by all who know him. His name will be familiar to many who peruse these few pages, not only as a cultivator of the soil; but of the mind, for he is the head-master of, it is believed, one of the most flourishing English Mofussil Schools in India, and it redounds much to his credit that a portion of his leisure hours should be thus usefully employed.

A money prize was most properly awarded to Walter Landale, Esq., for his superb Nerbudda wheat, and a similar one to George Barnes, Esq., of Colgong, for white linseed. We must not omit to mention that a very fine basket of Nerbudda wheat was brought from the farm of John Oman, Esq., of Colgong, and a sample of white linseed grown by F. Greenwood, Esq.* Two of our Tirhoot native subscribers sent musters of cereal grains, &c., to this exhibition, and although they did not win prizes, the samples were very creditable to their farms. They, however, carried off a prize each for leechees in the fruit show. Their names are Baboo Gobind Suhaee and Baboo Bridjbeharee Loll, of Mozuffurpore.

A fruit and flower show took place on the same evening. There were some beautiful bouquets of flowers to be seen, and one of exotics from the garden of J. Pontet, Esq., was deservedly admired. A remarkably fine show of grapes, peaches, Bombay mangoes, Mazagong mangoes, Rungpore plums, leechees, plantains, &c., were to be seen on the show tables, besides which, some very fine asparagus, Cherra Poonjee and other potatoes, and mangul wurzul of an enormous size, and in a most healthy condition. Several prizes were awarded.

In November a vegetable and flower show was held. In the former, early cauliflowers, early potatoes from Cherra Poonjee seed, vegetable marrow, and all other English vegetables were to be seen in great perfection, and in the latter a fine display of flowers. Prizes to the amount of 40 rupees were awarded.

In closing our account of the year 1846, we must not forget to mention, that a new seed and show-room, 46 feet long by 22 broad, with an 8 feet verandah all round, was built: another mallees' house, 32 by 18, and carriage drives through the public garden commenced on. We received the names of a great number of new subscribers from Tirhoot this year, also from Monghyr, Chupprah, Gyah, &c. &c., also a donation of one hundred rupees from H. V. Hathorn, Esq., Civil Service, Chupprah, and the sum of one hundred rupees from Robert Lowther, Esq., Civil Service, Allahabad, who has compounded for his subscription.

The donations of plants, seeds and the like were most numerous, and we must thankfully acknowledge all these kind presents.

Now commences 1847. There was a remarkably fine vegetable show in January. The following memorandum of the weight of a few of them will be quite sufficient to allow our readers to judge of the progress in that department of our public garden:

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* Was sent by that gentleman from Monghyr.

1 Stick of celery,	3½ lbs.
1 Ditto ditto,	2 lbs.
1 Ditto ditto,	2 lbs.
1 Ditto ditto,	2 lbs.

Drumhead Cabbage.—1 weighed 12 lbs., 1 weighed 8 lbs.

Red Cabbage.—1 weighed 5 lbs.

Beet-root.—3 pieces weighed 6 lbs.

Acclimated Cabool Onion.—3 onions weighed 4 lbs.

Acclimated Cherra Poonjee Potatoes.—12 potatoes weighed 5 lbs.

1 radish (Spanish) weighed 8 lbs.

2 vegetable marrow weighed 10 lbs.

A basket of artichokes, some of which measured 14 inches in circumference each.

The *dallees* from private gardens were unusually fine, and the competition for prizes great.

The floricultural department was very gay, and independent of the specimens from private gardens, there were some 25 bouquets of beautiful flowers, the produce of our public garden.

The profusion of roses of seven varieties, from Cleveland house garden, was greatly admired.

On the 26th of March, our Branch Society was fortunate enough to obtain the services of Mr. Robert Ross, an excellent botanist and practical gardener in all its branches, and it is believed that the readers of these pages cannot be better informed in regard to the state in which he found our public garden, than by perusing the following letter from Mr. Ross, to our Honorary Secretary:—

Sir,—On taking charge of the public garden last March, I was surprised to find the high state of perfection it was in, considering the short period that has elapsed since its formation. The variety of fruits, flowers, vegetables, &c., it contains, is considerable, and to enumerate all would take up some time. I am sorry I did not see it at a more favorable season of the year, when its various productions were in their prime. I have however seen enough to convince me, that a better site could not have been chosen for a public garden than that you have selected, both for the ripening of seeds and the growth of plants, not only from tropical, but temperate climates. My more than five years' experience as head gardener of the Hon'ble Company's Botanical Garden, Calcutta, enables me to say something of gardening in India.

2. Here I have met with some plants from Tropical America that produce seeds that we could never get a single seed from in the Hon'ble C. B. G. Calcutta. This I think speaks well for the soil or climate, or the treatment you have given them, or perhaps all united.

3. Some of the vegetables, &c., from which you have saved seed, I here enumerate.

Globe artichoke, asparagus, turnip, carrot, beans 3 sorts, peas, lettuce, endive, celery, beet-root, radish, Guinea-grass, cress, trefoil, cauliflower, lucerne, &c.

4. The large quantity of seed you have saved from most of the above, with many other species of seeds, I might mention such as English, Cape, and American flower seeds, &c., is of the very best description; as a proof of its being really good, I may observe that the ground where some of it was produced, is literally filled with self-sown seedlings, and this too at this unfavorable season of the year, and where they have simply had the benefit of a recent shower of rain.

5. Your plantations of globe artichokes, are as fine as any I have ever seen at home: to give some idea of their magnitude, some I find, and not a few, measure 15 inches in circumference, and average from 12 to 14 inches. I have no doubt many of them were much larger had I seen them in the proper season, and before any were cut for table.

6. Your fine asparagus is more like the English in flavour than any I have tasted in India, and a month hence, when this fine vegetable will be in its prime, I shall be able to report more fully on it.

7. Some of your fine healthy fruit trees I here enumerate.

Litchi.
Pears.
Loquats.
Bombay, Maldah and other mangoes.
Strawberry and other guavas.
Sapotas.
Alligator pear.
Apples.
Apricots.
Plums.
Desert figs from England.
Custard apple.
Sour-sops.
Shaddocks.
Madras and other citrons.
Vines.
Peaches.

and other fruit trees, most of which are large enough to admit of propagating largely.

8. I have never seen fruit trees in better health, some of the peach trees measure 36 feet in circumference, that is, to the extreme ends of the branches or the area of the ground each tree occupies, and all in a full bearing stock average from 25 to 30 feet. The crops of peaches on some of the trees are good, indeed we have been obliged to thin them frequently: some of the fruit measures 8 inches in circumference, though they have not yet reached their full growth.

9. Some of the apple trees are now in flower, and likely to produce fruit this season, and some of the pear trees promise to flower next season: on one pear tree I observe some shoots of last season's growth, 7 feet in length. I mention this that some idea may be formed of the soil and climate of this station.

10. Your extensive vinery of 250 feet in length, with an east and west aspect, both of which are planted with thriving vines of sorts, and some of the vines though young, have now a fair crop of healthy fruit. They were just coming into flower when I took charge last March, and now (May 5) the fruit on some 40 or 50 bunches, about one-third of the present crop, average one-half inch in circumference, though little more than half matured.

11. The coffee plantation now of three years' growth, is in a very healthy state, and many of the plants are now flowering, and give fair promise of yielding good produce. The Assam tea plants presented by Mr. R. Fulton to the Society are healthy. The 400 coffee and tea plants lately presented by Colonel Ouseley are full of health, and when planted out will no doubt thrive well.

12. The fruit and flower plants in the distribution nursery put me in mind of the Honorable Company's Botanic Garden, Calcutta, where I spent so many years, and if your garden progresses, as it has done since its formation, it will, as a Botanical Garden, (your garden is, strictly speaking, a Botanic Garden,) be second to none in India shortly.

13. Your potatoes are of the very best description, both in size and flavor, and I have no doubt the few you recently dispatched to England by the overland route, will be much valued, as they will be a change of seed. I may also mention your extensive plantations

of American maize, West India arrow-root, Jerusalem artichokes, plantains, &c. Your Nerbudda wheat, white linseed, flax and other crops, were nearly all harvested before I arrived.

14. You have many valuable specimens in your garden from South Africa, Tropical America, New Holland, Japan and other quarters.

15. I should not pass over your extensive variety of native vegetables, vegetable marrow, pumpkins, cucumbers, melons, aromatic plants, &c. &c.

16. Your neatly arranged seed-house contains no less than about 800 hermetically sealed quart bottles of agricultural, horticultural and floricultural acclimated seeds of the very best description, and you must have labored hard, single-handed as you were, to have brought your public garden and seed-house into such an efficient state in such short time. The acclimated seeds you have now in store are worth several thousand rupees.

17. Since I have seen what your garden is capable of producing under your superintendence, the knowledge of which you must have acquired from your own observation in this climate, (as English authors on agriculture, horticulture or floriculture are of no use in an Indian climate,) I have been thinking that such a garden as your public garden now is, just what the Agricultural and Horticultural Society of India ought to have. It must cost that Society a large sum annually for imported vegetable and other seeds, but with a garden like this, they might have all or nearly all within themselves.

18. In conclusion I beg to inform you, that several hundred Bombay and Maldah mangoe grafts, litchi, peach, rose-apple, English fig, and many others, are now preparing for distribution, and on the 1st September next I expect to strike some fifteen or twenty thousand cuttings of flowers and shrubs, and many of great variety and beauty.

(Signed) ROBERT ROSS,
Head Gardener.

May 8th, 1847.

On the 25th of May, an exhibition of Agri-Horticultural produce took place in the Society's public garden.

The cereal and other grains were first inspected.

There were several baskets of very superior Nerbudda wheat, white linseed, Cuba tobacco, flax, oats, American maize, besides a great many samples of indigenous wheat, barley, gram, safflower, pulse, &c. A medal was awarded to E. F. Lautour, Esq., Civil Service, Gyah, for two splendid samples of Scotch barley and white linseed, also for fine musters of Nerbudda wheat, American maize, &c. Mr. P. Onraet's Nerbudda wheat ranked No. 1 in the show, for which a money prize was given.

Another to Rajah Oodit Narain Sing, for the best tobacco and a sample of unusually fine gram, and a third to Mudden Tackoor, Zumeendar of Kulan, for No. 1 American maize.

In the fruit department grapes, leechees, peaches, plums, were the chief.

In the vegetable department asparagus, four sorts of potatoes, and vegetable marrow were best worthy of notice.

The sum of eight rupees was awarded to the gardener of G. Drummond, Esq., of Peergunge, Purneah, for a basket of remarkably fine peaches. Mr. Drummond's gardener also carried off prizes of some magnificent Cabool onions and Darjeeling potatoes, and we congratulate Mr. Drummond on the great success which has attended his efforts to get good produce from such a notoriously poor and bad soil as that of the Purneah district generally. It is much to be hoped that Mr. Drummond may win a medal at our grand show in May 1848.

On the 2nd of December another show was held, and hundreds of baskets of vegetables, all reared from English seed, were to be seen in the show-rooms. There was a new sort of cabbage called the nonpareil, splendid cauliflowers, peas of sorts in abundance, and the sugar-pea, a new and superb variety, attracted much attention.

The sum of seventy-four rupees and eight annas was awarded in prizes.

In closing this year we must note, that the Honorable Sir L. Peel; The Honorable Sir T. H. Maddock; Colonel Ouseley, of Chota Nagpore; Major Thoresby, Cutmandoo; Dr. Campbell, Darjeeling; John Hamilton, Esq., of Calcutta; Melmouth Hall, Esq., Lehrah, Goruckpore; Robert Lowther, Esq., Civil Service, Allahabad; L.

Manly, Esq., of Calcutta; Edward Lautour, Esq., Civil Service; F. Harley, Esq.; were our chief donors in plants and seeds.

We have great pleasure in notifying, that since Mr. Robert Ross' arrival in March last, immense improvements have been carried out, and that besides *many thousand* flower plants having been distributed since November last, thousands more are ready. The great success in raising seedlings from English seed in particular is worthy of record, scarcely in any one instance has a failure taken place: 450 of the finest Bombay mangoe grafts have been prepared under Mr. Ross' own immediate superintendence, about 200 leechee *untas*, and hundreds of peach, coffee and tea seedlings raised from seed.

The striking of cuttings of the *Bugginvillæa spectabilis*, scarlet and other *Verbenas*, *Banisteria laurifolia*, *Euphorbia jacquiniflora*, roses of eleven varieties, *Salvia splendens*, *Asystasia formosa*, *Plumbagoes*, *Passifloræ*, *cum multis aliis*, are going on also most successfully, and in every department of the garden grand improvements are taking place. A neat bungalow, consisting of two rooms and a verandah all round, has been built for Mr. Ross, with suitable out-houses: several new wells have been sunk and carriage drives, some seven in number, completed.

The gardeners are mustered by Mr. Ross early every morning, and work for the day apportioned to all, and in taking leave of the year 1847, we have every reason to be thankful for all that has been stated, together with an encreasing list of subscribers.

The monthly expences of the garden are now about 350 rupees per mensem, exclusive of seeds, &c. &c.

Now for the year 1848. A show was held on the 11th of February, and this is the last we shall have to notice in these pages for the present. It is highly satisfactory to notify, that the show-room and its long verandahs were filled to excess with baskets of most excellent vegetables, and it was the opinion of all assembled, that such a satisfactory exhibition had never before been witnessed in India, and seldom perhaps surpassed in England.

The Bombay, Darjeeling, Cherra Poonjee, and other sorts of potatoes, and all quite free from disease, were indeed worth looking at: 40 potatoes from Cleveland house garden weighed 20 ℔s.

In the floricultural department there were many new and rare flowers introduced to notice.

A splendid bouquet of the *Bugginvillæa spectabilis* and *Banisteria laurifolia,* were deservedly admired. The *Pansies,* double violet, double stock of rich colors, double tuberose, and two superb plants of the *Euphorbia jacquiniflora* in fine blossom, and a great variety of beautiful annuals ornamented the show tables.

In advertence to our West India arrow-root crop we are happy to say, that 150 bottles, each containing 24 ounces of the powder, have been manufactured, and the following certificate will show those who desire to know further about it, how far it can be recommended :

"Certified, that we have examined a specimen of arrow-root prepared from the *Maranta arundinacea,* the growth of the Bhaugulpore public garden, that it appears to us to possess all the nutritious properties of the best West India varieties, and that on account of the care bestowed on its preparation and its consequent purity, we can strongly recommend it as equal, if not superior, to the best kinds procurable in this country."

(Signed) A. GRANT, *Civil Assist. Surgeon.*
,, H. DRAPER, *Assist. Surgeon, Hill Rangers.*

Our fruit trees and vinery are in a most flourishing condition: at this moment (the 22nd of March), some of the peach trees have fruit nearly full grown on them.

Our young Bombay mangoe trees (grafts) have plenty of fine fruit on them, but only half a dozen mangoes will be allowed to remain on each. Whilst on this subject, we cannot do better than allude to the great benefit of grafting, if the operation be skilfully performed. Grafts made last August, came into blossom in the public garden at the same time the parent trees from which the grafts were obtained in Cleveland house orchard did, and fruit has actually formed on them, but will not of course be allowed to remain.

The grafting of loquats is not so much required, for the seedling trees give very fine fruit at the age of three years, and many of that age are to be seen in full bearing in our garden at this moment, whereas mangoe seedlings take 10 years before they bear fruit largely.

Our *rubbee* experimental crops are remarkably fine, particularly the Nerbudda wheat and Cutmandoo barley, which is first-rate. Lucerne and trefoil occupy a place in the agricultural department, also flax, English oats, barley and wheat, white gram, white and red linseed—and in May next there will be a grand agricultural exhibition, at which three medals will be competed for.

We cannot close this better than by giving in Appendix A.* a list of the present subscribers to our Branch Society, and in Appendix B.* a list of money donations since the formation of the Society, and we now beg to assure the Parent Society, how much we feel their kindness in the unceasing and lively interest they continue to evince on all occasions to this Branch of the Parent Tree.

With the handsome support we are receiving from nearly 300 subscribers, and the good wishes we believe of a great many non-subscribers, it would be hard indeed, if our progress were impeded. We hope on the contrary, that the great care and unceasing exertions which are bestowed on every thing connected with its "going a head," will be an earnest for its ultimate success in carrying out the grand object for which it was formed, viz. the improvement of agriculture, horticulture, and floriculture in all their respective branches.

To those gentlemen, who first acted as Honorary Joint Secretaries to our Institution, and on leaving their stations relinquished that duty, we first desire to offer our best thanks for the great assistance rendered by them. T. C. Trotter, Esq., of the Civil Service, was wonderfully successful in the district of Tirhoot in every thing which could advance the interests of our Branch Society. The number of our subscribers in that district is very large, indeed the greatest liberality has been manifested by the Civil and Military Services, and our excellent friends the Planters.

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* We regret our inability to find room for these Appendices; but it may suffice to mention, that Appendix A. shows a list of 288 subscribers from 1843, when the Society was formed, to March 1848; of whom 259 pay Rs. 1-8 per mensem, and 29 at the rate of twelve annas per mensem. Appendix B. gives a list of donations in money, for the same period, amounting to Rs. 2,428.—Eds

To G. L. Martin, Esq., Civil Service, Purneah; R. F. Hodgson, Esq., Monghyr; G. W. Brown, Esq., Purneah; E. F. Lautour, Esq., Gyah; Dr. Irvine, Patna; Captain Milne, Ghazeepore; we feel very much indebted for their valuable aid.

To our present Honorary Joint Secretaries, the Honorable F. Drummond, Civil Service, of Purneah; W. Travers, Esq., Civil Service, Monghyr; Dr. Denham, Gyah; J. F. Lynch, Esq., of Mozuffurpore; R. King, Esq., of Patna; T. Wyatt, Esq., Civil Service, Rungpore; C. Steer, Esq., Civil Service, Dinagepore; R. C. Raikes, Esq.; Thomas Griffin, Esq., of Buxar; and last though not least, Walter Landale, Esq., of Luttypore; the best thanks of our Society are with much pleasure accorded for the great help they are affording us in their respective districts.

We had nearly forgotten to mention that about 600 rupees worth of flower and vegetable seeds are expected in May from the Cape, from Mr. Upjohn, which, with the immense assortment of acclimated seeds now in our seed-room, will ensure it is hoped, an ample supply to all our subscribers. Plants, shrubs, grafts, &c., (some twenty thousand) will be ready for distribution in the early part of November, and as we have a good many left of last year's stock, we are always ready to comply with an indent from stations which are only approachable by water in the rainy season.

In conclusion we annex a Memorandum of Receipts and Disbursements for 29 months, in full, up to the 31st December, 1847, showing a balance in favor of the Society on that day, of 707-14-1½.

By order of the Garden Committee,

T. E. A. Napleton,

Honorary Secretary.

The Honorary Secretary in Account Current with the Bhaugulpore Branch Agri-Horticultural and Floricultural Society, from the 1st *of August* 1845, *to the* 31*st December* 1847, *being* 29 *Months.*

Cr.				*Dr.*			
Balance in favor of the Society on the 31st of August, 1845, ...	416	0	4½	Total expended from the 1st of August 1845, to the 31st of December 1847, ...	10,032	3	9
Amount of Money Donations received since the 1st of August 1845, to the 22nd of March 1848, ...	352	5	0	Balance in favor of the Society on the 31st December 1847, ...	707	14	1½
Amount realized by vegetable dallees,........	365	4	6				
Received from the Parent Society, with two silver medals for 1846, ...	50	0	0				
Received from the Parent Society, with two silver medals for 1847, ...	50	0	0				
*Amount of Subscriptions from the 1st of August 1845, to the 31st of December 1847, ..	9,496	8	0				
Money realized by sale of tamarinds for 1846 and 1847, ...	10	0	0				
Total Company's Rupees, ...	10,740	1	10½	Grand total Company's Rupees,........	10,740	1	10½

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* Nearly a third of this sum has not been yet received, but is under collection, and may be expected shortly from the Honorary Secretaries of the districts in arrears.

E. E.

T. E. A. Napleton,
Honorary Secretary.

REPORT OF EXHIBITIONS OF VEGETABLES, FRUITS, FLOWERS AND AGRICULTURAL PRODUCE, HELD AT BHAUGULPORE, ON 11TH FEBRUARY AND 25TH MAY, 1848.

(Communicated by Major NAPLETON, *Honorary Secretary Branch Agri-Horticultural Society.)*

On Friday, the 11th of February 1848, an exhibition of flowers and vegetables took place in the Society's Botanical Garden, at 4 o'clock in the evening, where upwards of a hundred members of this our Branch Society were in attendance, besides a great many visitors. The show-room and its verandahs were quite full of *dalees*, and the improvement in the produce of private gardens proved so great, that it attracted general attention, and perhaps such a satisfactory show of vegetables has never been witnessed in India, and seldom surpassed in Covent Garden or other English markets.

The potatoes from Bombay, Darjeeling and Cherra Poonjee seed were wonderfully fine and healthy, and to enable the public to form some idea of the state of perfection this grand and staple vegetable has been brought to in this district, it is here recorded that forty potatoes out of one garden weighed 20tbs. The skin of all delicately white and fine, and every potatoe free from knots. The sugar-pea perhaps deserves to be next noticed. This splendid variety of the *Pisum sativum* was introduced on a small scale into this district last year, and from the acclimated seed, the crops are now most luxuriant, and more fruitful by far than any other sort, the pod is very long and almost transparent. Next comes the vegetable marrow, of which there were a few *dalees*. The crown variety or squash is a fine vegetable on the tables, but a longer variety, and of a greener color, exhibited on this occasion, is considered far superior to it in regard to flavour. Next come Globe artichokes, late cauliflower, of a fine size with delicately white heads. Savoy, red, and nonparcil cabbages: carrots from English seed. Turnips of the white stone or American flat variety of the most delicate flavour, celery of the finest description, *cum multis aliis*, were to be seen on the show tables in the greatest profusion. The produce of the Society's garden (none of the *dalees* of which are allowed to compete for prizes) consisted of—

Floricultural Department.—Ten varieties of roses, four varieties of *Verbena,* including the *Melindres,* three varieties of violets, viz. *Viola tricolor, V. odoratissima,* and *V. serpens,* four varieties of double and single stocks, double tuberose *(Polyanthes tuberosa), Euphorbia jacquiniflora, Nolana prostrata, Bartonia aurea,* three varieties of *Jatrophas,* viz., *J. rosea, J. panduræfolia,* and *J. carnosa, Asystasia formosa, Erysimum Peroffskianum, Malpighia glabra, Collinsia bicolor, Linaria speciosa, Phlox Drummondii, Clarkia elegans rosea, Maurandia Barclayana,* five varieties of *Pelargoniums, Aristolochia trilobata,* and *A. indica* or snake-plant, *Thunbergia alata, Ipomœa semperflorens,* and *I. rubro-cœrulea, Banisteria laurifolia,* Lupins of sorts, two varieties of *Tecomas,* viz., *Tecoma jasminoides,* and *Tecoma stans, Saponaria officinalis, Beaumontia grandiflora,* and several varieties of other rare flowers.

Vegetable Department.—Marrow-fat, sugar, and other peas, drum-head, flat, Dutch, Battersea, Savoy, nonpareil, large and dwarf York, sugar-loaf, and other cabbages, Darjeeling and Bombay potatoes, Altringham, earlyhorn, long orange and Nepaul carrots, beet-root, and mangul wurzul, bush and crown vegetable marrow, late cauliflowers, red and white nohl-kohl, flat, Dutch, white stone and purple top turnips, Windsor and French beans. A large basket of the finest white celery, Globe and Jerusalem artichokes ; endive beautifully blanched, coss and cabbage lettuce, Tenasserim and other yams. A basket of splendid Cabool capsicums, also love-apples *(Solanum lycopersicum),* onions, leeks, &c. &c. &c.

The umpires (Captain Don, Philip Crump, Esq., Robert Ross, Esq., and Moonshee Sultan Mohamed) pronounced the whole of the above enumerated vegetables remarkably fine, and highly creditable to our Branch Institution.

[Prizes were then awarded to ten *mallees* for best specimens of the vegetables and flowers already detailed, and for several other sorts.]

List of Donations since the 3rd of December, 1847.

From J. Duhan, Esq., Opium Agent, Bhaugulpore, the sum of ten rupees.

From Lieut. John Nelson Thomas, 39th Regiment N. I., a small supply of *Orchidæa,* from Darjeeling, which are thriving very nicely.

From C. Donzelle, Esq., of Toolseeah, a supply of pine-apple plants, of a very fine sort.

From Mrs. Pringle, Purneah, thirty pine-apple plants, one plant of *Daphne,* and one of *Vaccinium,* also a garden implement for transplanting, which proved most acceptable.

From Dr. Campbell, Darjeeling, three bags of Darjeeling potatoes, some cuttings of *Fuchsia* and raspberry plants.

From G. F. Brown, Esq., a few species of sugar-cane, of a very fine sort, brought by him from Dinagepore.

From Colonel Ouseley, Governor General's Agent, Chota Nagpore, a packet of China tea seeds.

From W. T. Taylor, Esq., Civil Service, Purneah, a supply of fine strawberry plants and pine-apple shoots.

From Mrs. Dr. Bowling, several packets of rare flower seeds, most of which germinated freely.

From Charles Smith, Esq., late of the Civil Service, Cherra Poonjee, several packets of seeds from the Cossia hills.

From Major Thoresby, Resident at Kutmandoo, some packets of Nepaul pine and other seeds, which have germinated vastly well.

From Melmoth Hall, Esq., Lehra, Goruckpore, continued contributions of seeds indigenous to that district, accompanied by dried leaves and flowers of the parent trees when practicable, also some English *Laburnum* seed.

List of New Subscribers since the 3rd of December, 1847.

Dr. William Martin, Captain Studdy, Henry Swetenham, Esq., C. S., Major General A. Watson, C. Steer, Esq., Charles Nelson, Esq., Moulvie Ojeh Oollah, Syud Mahomed, Zumeendar.

Friday, the 26*th of May,* 1848.

Our annual exhibition of cereal grains, and also one of vegetables, flowers and fruits took place yesterday evening, in the Society's show-rooms, and was attended by 13 ladies, about 80 members of our Branch Society, besides many visitors. The day previous was, it will be recollected, the Birth-day of our Gracious Queen, and a very eventful one it was in more respects than one, for about 3 o'clock P. M., day was suddenly turned into night, and a most furious storm from the westward, accompanied by heavy rain, raged with unabated violence for an hour, and may, without exaggeration, be brought under the denomination of a hurricane. Trees were blown down or split into pieces, garden trellices carried away, boats wrecked or stranded, out-houses and huts unroofed in all directions, and nearly the whole of the mangoe crop was discovered under the trees. As may be supposed, such a stormy preface to the show did not tend to improve the floricultural specimens, or those in the fruit department. Captain Tickell, Dr. Chalmers, J. H. Savi, Esq., and Walter Landale, Esq., obligingly acted as umpires for cereal grains, fruits and vegebles, and tested with much care the samples laid out for competition. The show-room and its verandahs contained 25 large tables, every one of which was completely covered with *dalees*, and for want of more room several baskets of fruit and vegetables were laid along the ground. The produce of our Branch Society's garden in all departments was highly commended by the umpires, who pronounced every thing to be unexceptionable in quality.

The samples of cereal grains consisted of a large basket of superb wheat, acclimated from Nerbudda seed, presented to our Society three years ago by Colonel Ouseley, of Chota Nagpore, two baskets of acclimated Scotch and Kutmandoo wheats, (the former grown from seed presented to the Society by Edgar Lautour, Esq., of the Civil Service, and the latter by Major Thoresby, Resident Kutmandoo) of a very superior description. Very fine oats, grown from seed sent out by the Hon'ble the Court of Directors and presented to us by the Parent Society, a beautiful sample of barley, grown from Kutmandoo seed, sent us by Major Thoresby, two new sorts of *dhall*, white linseed and flax seed, potatoes, a large basket of the Bombay sort, weighing upon an average thirty tolahs each, a large basket of fine Cuba and Havannah tobacco, of the growth of 1846, and which was a complete nosegay to those fond of a weed or the *hooqah*.

Fifty large baskets of vegetable seeds, acclimated from Cape, English and American seed, four *dalees* of splendid peaches, two of fine grapes, *alloo-bokharas*, plantains, sour-sops, asparagus, beet-root, cucumbers, red cabbages, carrots, Bombay and Cabool onions, &c. &c., and in the floricultural department some rare exotics, too numerous to detail (one in particular, the *Portulaca grandiflora*, was in lovely blossom), likewise some Bombay mangoe grafts, lately separated from the parent trees, with a fine mangoe on each.

Next comes the awarding of prizes for the produce of private gardens and farms in this and adjacent districts.

A silver medal was awarded to C. Donzelle, Esq., of Toolseah, for the finest samples of cereal grains, pulse, seed of Lima and other fine varieties of beans, a basket of very fine onions, &c.

A money prize of five rupees was awarded to Dr. Denham, Civil Surgeon, Gyah, for the following samples of cereal grains: one bag of superb acclimated Nerbudda wheat (seed furnished by the Bhaugulpore Society), one of vastly fine acclimated Scotch wheat, one of very superior acclimated oats from English seed, sent out to the Parent Society by the Hon'ble the Court of Directors, one of white gram, grown from seed furnished from our Branch Society. The umpires would most certainly have awarded a medal to Dr. Denham had his samples been more numerous. There were numerous samples of grain from the farms of G. Barnes, Esq., of Colgong, Rajah Oodit Narain Sing, of Aulumnuggur, Muddun Tackoor, Zumeendar of Kulan, Bhaugulpore, *cum multis aliis,* but after a most patient inspection of all, the umpires did not consider any sufficiently good to deserve a medal. In closing the account of agricultural produce, it is but proper to mention, that in consequence of no rain having fallen here from November last up to harvest time in this district, cereal grains of all sorts are mostly of a very inferior description this year.

A silver medal was awarded to George Drummond, Esq., of Peergunge, Purneah, for three large baskets of the finest peaches perhaps ever seen in Bengal,* many of them weighing twelve tolahs, also a basket of magnificent acclimated Darjeeling potatoes, many of them weighing thirty-five tolahs each. These potatoes were very free from knots, and had a very fine skin, also some very fine cucumbers, Bombay and Patna onions, and a remarkably fine bundle of asparagus, grown in the garden of G. H. Gatfeild, Esq., of Mohinderpore, Purneah. Mr. Drummond is certainly taking the lead as an horticulturist in the Purneah district, as far as our Branch Society has had the means of judging, and we trust the time is not far distant when Mr. Drummond will carry off a medal for cereal grains, notwithstanding the soil of that district is generally considered unfavorable to wheat and barley cultivation.

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* It will be seen from the proceedings of the Parent Society, for July 1848, page cxxi, that Dr. Scott has raised this year in his garden at Gowhatti, Assam, scores of peaches, weighing upwards of 10 and 20 tolahs each.—Eds.

We were glad to see a few samples of cereal grains and pulse from the farms of R. Buckland, Esq., of Gocoolnuggur, Purneah, and from the native zumeendars of that district.

The following is the result of the competition for horticultural produce:

The sum of 54 rupees 8 annas was awarded in prizes, and we must not omit the mention of the Ladies, viz., Mrs. Alexander, Mrs. Taylor, and Mrs. Shore, who most kindly tested the floricultural specimens, and distributed the prizes.

To the gardener of J. Pontet, Esq., the sum of six rupees, for two beautiful plants of the *Gesneria* family (natural order *Gesnericæ*), two plants of *Mammillaria* (natural order *Cacticæa*), for the greatest variety of geraniums, and two splendid plants of lavender.

To the gardener of W. S. Alexander, Esq., C. S., the sum of 4 rupees 4 annas, for a beautiful plant (in fine blossom) of the *Phlox Drummondii*, a fine bouquet of *Solanum macranthum*, and for grapes, peaches, and Bombay mangoes.

We must now bring to notice our having received from T. Wyatt, Esq., Civil Service, Rungpore,—

Twelve fine sapotas, one of an unusually large size, some peaches, leechees, Rungpore plums, and some very fine acclimated Darjeeling potatoes, and although the distance between the two stations must be nearly 200 miles, still these fruits, &c. arrived in excellent order. Prizes to the amount of six rupees were awarded to Mr. Wyatt's gardener.

Prizes were awarded to ten other *mallees* for best samples of vegetables, fruits and flowers, and last though not least we have to note, that a prize of two rupees was awarded to the *mallee* of Robert Fulton, Esq., of Sultangunge, for a remarkably fine bunch of grapes, clearly showing that either the soil of Mr. Fulton's garden, the climate of Sultangunge, or the skill of that gentleman's gardener, are highly favorable to the growth, and bringing to maturity of this delicious fruit.

In conclusion, we have much pleasure in notifying that on the 17th ultimo, a large supply of fresh vegetable and flower seeds (our

Branch Society's annual supply) reached Calcutta from the Cape, from that well known and experienced Seedsman, Mr. Upjohn, on the Ship "Zenobia," and that several thousand flower plants, fruit-grafts, grapes, vines, &c. are now ready for distribution: moreover, that our stock of acclimated seeds is unusually large and fine this year.

REPORT OF AN EXHIBITION OF FLOWERS AND VEGETABLES HELD AT CUTTACK, ON 10TH FEBRUARY 1848.

(Communicated by W. GILMORE, ESQ., *Secretary Branch Agri-Horticultural Society, Cuttack.)*

I have the pleasure to send you the following report of an exhibition of flowers and vegetables, held on the 10th instant.

In consequence of the late period at which the rains ceased, the vegetables produced for competition were not so fine as they might have been: the only specimen of potatoes was produced in the public garden, and the few specimens of cauliflower, were so poor that no prize was given for them. The flowers were very good and in great variety.

The few seeds of *Ipomœa rubro-cœrulea* forwarded by you, all germinated and flowered in the greatest profusion.

I shall have much pleasure in sending you a packet of the seed, should the Society desire it. The sweet-peas (from Lucknow) are also in full flower.

The amount distributed in prizes was rupees thirty-four. One medal was awarded for the best bouquet of flowers. Subjoined is a list of the prizes.

CUTTACK: *19th February,* 1848.

Prizes were awarded to—

Mr. Gouldsbury's	mallee for	best Turnips.
Mr. Mactier's	ditto,	.. 2nd ditto ditto.
Mr. Gilmore's	ditto,	.. Carrots.
Ditto	ditto,	.. Cabbages.
Ditto	ditto,	.. Knole-kole.
Mr. Deede's	ditto,	.. Celery.
Ditto	ditto,	.. Savoy Cabbage.
Ditto	ditto,	Onions.
Mr. Mactier's	ditto,	
Mr. Ainslie's	ditto,	.. Peas.
Ditto	ditto,	.. Beet-root.

Mr. Deede's mallee for best *dallee* of vegetables.
Mr. Gouldsbury's ditto, 2nd ditto ditto.
Mr. Deede's ditto, for best bouquet of flowers.
Mr. Gilmore's ditto, } for 2nd ditto ditto.
Mr. Mactier's ditto, }

HINTS FOR THE SELECTION OF THE SENNA PLANT AND ITS PREPARATION FOR THE EUROPEAN MARKET.

To J. HUME, ESQ., *Honorary Secretary Agricultural Society.*

SIR,—The Medical Board, under instructions from the Government of India, have desired me to forward to you copy of para. 14 of a Dispatch, No. 25, of the 29th September last, from the Court of Directors of the East India Company, together with the printed Extract of Professor Royle's work on Materia Medica, Article "Senna," to which it gave cover.

2. The communication, as containing useful hints for the selection of the plant and its preparation for the European markets, will, it is hoped, be considered to be sufficiently interesting to the members, and to the public generally, as to induce you to further the views of the Court by giving it a place in an early number of the Transactions of the Society.

J. FORSYTH, *Surgeon,*
FORT WILLIAM: *Secretary Medical Board.*
Medical Board Office, 3rd February, 1848.

Extract from a Dispatch from the Honorable the Court of Directors, in the Public Department, No. 25, dated 29th September 1847.

"14. The Senna grown in the Seharunpore Botanic Garden, and which the Natives in the neighbourhood of Agra and Muttra are said to cultivate extensively, having been found to be of the best quality, we approve the proposal of the Medical Board that the Senna for the public service should be supplied from Seharunpore. We forward as a number in the packet an extract from a work on Materia Medica by Dr. Royle, containing a description of the various species of the Senna plant, and suggestions for its improvement for the European market by more careful picking. It would be desirable to adopt means for making this information generally known."

"The Sennas of commerce may be arranged as follows :—

"1. TINNIVELLY SENNA, first cultivated in the district of that name, in 12° N. lat. by the late Mr. Hughes, from seed probably obtained from Arabia or picked out of *Suna Mukki*, as was done by the author when he cultivated Senna at Seharunpore. (*v.* Himal. Bot. p. 186, t. 37, and Trans. Med. Soc. of Calcutta, v. p. 433.) The author also grew Senna from Tinnivelly seed sent to him by Sir C. now Lord Metcalfe ; but he did not find the smallest difference between the two when grown in the same situation. The Tinnivelly Senna is well-grown and carefully picked ; the leaflets are of a fine, rather lively green color ; thin, but large, being from one to two inches in length, truly lanceolate. This kind is "highly esteemed in this country, and is quickly displacing all the other sorts in this (that is, Edinburgh), and many other cities in Britain." (Christison.) Dr. A. T. Thomson says of it, it is mild in operation, certain as a purgative, and operates without griping. It is now cultivated by Mr. Hughes' successor.

"*Seharunpore Senna,* the same kind of Senna, cultivated at Seharunpore, differed only in the leaflets being smaller, as might be expectd from the more northern latitude (30°). These the author prescribed in the hospitals at Seharunpore, and found them effective as a purge, and operating without producing inconvenient nausea or griping. Mr. Twining, after trying them in forty-five cases in the General Hospital at Calcutta, says in his report to the Medical Board : "From these trials, I am disposed to consider the Senna now under trial equal to the best I have ever seen."

"*Madras Senna.* Senna is now imported also from Madras, the produce of that Presidency. In 1843-44, I find 11,536 lbs. were exported to this country, having been previously imported into Madras from Tinnivelly, where it is cultivated by the natives, and is of the same nature as Mr. Hughes' Senna, though not so well grown nor so carefully picked. Dr. Christison says of it, the leaflets are longer than those of Bombay Senna, and not so taper-pointed, but otherwise differ only in being better preserved, and being more active, are more esteemed.

"Dr. Searle, in a communication to the India House, says of this Senna, "that now furnished to the profession by the Madras Government is in my experience as good quite as the Alexandrian :" "every leaf of the Indian being of the genuine spear-shaped species."

"2. BOMBAY or Common Indian SENNA, *Suna Mukki* of the natives, is first imported into Bombay from the Arabian Gulf.

"316,728 lbs. in 1837-38 | 570,426 lbs. in 1838-39.

"Re-exported to Great Britain, 262,284 lbs. in 1838-39.

"That this Senna forms a large, if not the largest proportion of what is consumed in this country, is not only evident from the above importation, but also from a comparison with the whole quantity of the other Sennas imported, as given by Dr. Pereira.

	1838.	1839.
"From East Indies ..	72,576 lbs.	110,409 lbs.
"From other places ..	69,538 „	63,766 „

"Some of this Senna is no doubt produced in Africa, as stated above by Dr. Malcolmson; a good deal of it in Arabia, probably by *Cassia lanceolata* and some perhaps by *C. Forskalii.* The leaflets are thin, lanceolate, usually entire, about an inch or an inch and a half in length, narrower than either the Tinnivelly or Seharunpore Senna, probably from growing in a poorer soil and drier climate. They are of a pale green color, often with dark brown-colored leaflets intermixed, also some pods, and many leaf-stalks, with occasionally other impurities. The good specimens of this Senna are, however, of excellent quality, and its commercial and medical value would be much increased, if the finest leaflets were picked out. It is in constant use in hospital practice in India, and generally highly approved of. The author prefers them for all purposes to the following kinds as found in commerce.

"3. ALEXANDRIAN SENNA is an excellent kind, when the genuine lance-shaped leaflets have been picked out; but that commonly employed in this country, is a mixed and very impure kind, being made up of the leaflets, much broken, of *C. lanceolata* and of *C. obovata,* with some pods and broken leaf-stalks, and also with leaves of other plants. It should be used only after having been carefully picked, as directed in the E P. Picked Alexandrian Senna is of a pale green color, with a faint smell. The leaflets are broad-lanceolate, the two sides unequal; they are thicker and shorter than the Indian Sennas.

"The lanceolate Senna of Upper Egypt, Nubia, and Senaar, yields two crops annually, the plants being cut down in spring and autumn, dried in the sun, when the leaves are stripped off, packed in bales, and sent to several *entrepôts*, and finally to Boulac, in the vicinity of Cairo. Of the lanceolate Senna *five* parts are here mixed with *three* parts of the leaflets of *C. obovata,* brought from other parts of Egypt and even from Syria, and also with the leaves *(two parts)* of *Cynanchum Argel.* This mixed Senna is that exported from Alexandria. On the Continent a further addition is made of the leaves of *Colutea arborescens* and of *Coriaria myrtifolia.*

"Dr. Pereira states that, "under the name of *heavy senna* he has met with *argel* leaves, which were sold at a higher price than ordinary senna," and Dr. Christison mentioned, what indeed may often be seen, that is, Argel leaves left intermixed even in what is called picked Alexandrian Senna. This Senna is often called "Sené de la Palthe."

"4. Tripoli Senna, is brought from Fezzan to Tripoli. This has the general appearance of Alexandrian Senna, but is less esteemed, though it is a more pure Senna, probably because the leaflets are more broken down, and all the leaf-stalks have not been removed. The leaflets are shorter and less pointed than in lanceolate Senna—indeed, more ovate; hence this Senna is said to be produced by *C. ovata* (C. æthiopica); but it also contains leaflets of *C. obovata,* which species was found in Fezzan by Dr. Oudney.

"5. Aleppo Senna is now seldom imported into this country. It consists of the leaflets of *C. obovata,* as do some other kinds, such as Italian Senna. Dr. Ainslie says, that the *obovate* is the only kind of Senna met with in India, meaning the Peninsula of India; for it is not met with in the Bengal Presidency; nor, according to Dr. Searle, is it used in that of Madras at the present day. It is less effective as a purgative, and apt to create nausea and griping.

"*Adulteration.*—Commercial Senna is prepared for use by picking out the leaflets, and rejecting the leaf-stalks, also extraneous matter, as dust, date-stones, &c., as well as the leaves of other plants. The legumes, however, possess the cathartic properties of the leaves to a considerable extent, and were alone used by the original Arabs; and there is no reason to believe that the stalks are inert. The most important adulterations are, however, the leaves of other plants. Those of the *Argel* may be distinguished by being lanceolate, equal on the two sides of the midrib, thick, leathery, and paler. They operate very dubiously as a cathartic, but occasion griping and protracted sickness. Those of *Tephrosia Apollinea* are obovate downy, and the veins proceed transversely from the midrib to each margin of the leaf without forming a marginal vein. The leaves of *Colutea arborescens,* or Bladder Senna, are ovate, but equal at the base. Those of *Coriaria myrtifolia* are astringent, usually broken down, and marked on each side of the midrib with a strong lateral nerve. As the systematic adulteration of Senna in Egypt with the leaves of other plants is objectionable, and has been so noticed by the Pharmaceutical Society, the most efficient method of stopping it would be to purchase only the pure African and Arabian Sennas which come to us by Bombay, instead of (unless it has been picked) that which is called Alexandrian, from its place of export (*v.* P. J. ii. p. 36). In India, a good substitute for Senna is afforded by *Rae Suna.* (*v* Compositæ.)"

NOTICE REGARDING ARISTOLOCHIA ANGUICIDA—SNAKE ARISTOLOCHIA, OR BIRTHWORT.

Extract of a letter from R. W. G. FRITH, ESQ., *dated* 13*th May*, 1848.

I believe the Society do not receive "*Curtis' Botanical Magazine*," I therefore send you an extract from that work, taken from the March No. for 1848, which I have just received, of a species of "Aristolochia," *A. anguicida, Snake Aristolochia* or *Birthwort.*

I send this, thinking it may be interesting from the mention made of the fact, of the plant being used in both the Americas by the natives, not only for the destruction of venomous snakes, but for the cure of persons who have been bitten by them. The discovery of this remedy having been so recently made in this country, and as is generally the case in such circumstances, remaining a matter of doubt with many, as to its real efficacy in the cure of snake-bite.

The notice of this plant in the Magazine is accompanied by a colored illustration of it in flower, which perhaps you would like to see. The account states it to be "a singular and very little known species of *Birthwort,* native of new Granada."

"Jacquin discovered it at Carthagena. Our Collector, Mr. Purdie, sent it to the Royal Gardens of Kew, where it first flowered in December, 1845. As the natives of North America employ the *A. serpentaria* (which Mr. Bosch says is one of the most active sudorifics known) for destroying serpents, and also for curing persons bitten by those reptiles, so the natives of South America (new Granada) employ this for similar purposes. "The juice of the root," according to Jacquin, "mixed with the saliva by mastication, renders powerless a serpent of moderate size, if one or two drops are put into the mouth of the creature, when it may be handled for several hours and put into the bosom with impunity; but after a time the animal recovers: a larger quantity however occasions its death."

"Jacquin attributes to the odour of the root the faculty of driving away serpents, when they approach this plant; and he also relates, that "the juice applied to the recent bite of a serpent, or taken internally, infallibly cures the patient."

RESULT OF TRIALS GIVEN TO CERTAIN SEEDS AT CAWNPORE.

Extract of a letter from Lieut. John Eliot, *dated Cawnpore, 14th February,* 1848.

"I must now give you some accounts of the success with my seeds—flower, vegetable and farm. To begin with the last; the barley did not germinate though dibbled in garden ground with care, so I did not sow the wheat. The hemp came up, but appears exactly the same as that sown by the ryotts all about here: a few seeds of mangul wurzel germinated, and I have now some very fine plants which I am keeping for seed; in case you should like to have any let me know, I will send some down. The kohl rabi and cabbages succeeded; the latter grows to an enormous size, and throws out innumerable offshoots, and would prove very valuable for feeding cattle I should think, particularly in this part of the country, during the hot season, at which time green fodder is not procurable for love or money. The tares did not come up, but the clover (of 3 sorts) has; one sort, with a yellow blossom, grows most luxuriantly. This completes the farm seeds I think. The vegetable seeds all came up well but the French beans, which seem to lose their germinating power or vitality sooner than peas. I will now give you the names of the flower seeds that germinated: scarlet Brompton stock, large, white, 10 week stock, *Escholtzia crocea, Calliopsis bicolor atro-sanguinea, Nemophila insignis, Petunia Phœnicia,* a very beautiful dark purple, *Collinsia bicolor, Convolvulus minor, Calliopsis Drummondii, Cineraria, Clarkia, Godetia Lindleyana, Balsam, Schizanthus humilis, Zinnia elegans, Portulaca grandiflora, Salpiglossis.* This makes only 16 or 17 out of 37, which was the number of English flower seeds I received; some of the American have come up of the same kind as those which failed from English: thus—*Heartsease, Larkspur, Campanula, &c.*"

A list of specimens of Veneered American Woods, presented to the Society's Museum, by C. Huffnagle, Esq.

No. 1. American elm. *Ulmus Americana.*

This is a relic of the tree under which William Penn held his famous treaty with the Indians, where Kensington now stands.

2. Common yellow pine. *Pinus variabilis.*
3. Red mulberry? *Morus rubra.*
4. White oak. *Quercus alba.*
5. Sugar maple, variety "Bird's eye." *Acer saccharinum.*
6. Chesnut. *Castanea.*
7. Sugar maple, variety "Blister maple."
8. Black walnut. *Juglans nigra.*
9. American Bird cherry. *Prunus serotina.*
10. Tulip poplar. *Lireodendron tulipefera.*
11. Beech. *Fagus Americana.*
12. Sugar maple. *Root.*
13. "Green ebony" so called by the cabinet makers. *Unknown.*
14. Orage orange, or bow-wood. *Maclura aurantiaca.*
15. Butter-nut or white walnut. *Juglans cinera.*
16. Persiman.
17. "Red elm," so called by the cabinet makers. *Ulmus sp.*
18. Elm from a *Knarl.*
19. Candle tree. *Catalpa cordifolia.*
20. American Bird cherry. *Knarl.*
21. Elm, *sp.?*
22. Beech. *Betula sp.*
23. Red cedar. *Juniperus virginica.*
24. Sassafras. *Laurus sassafras.*
25. American plane or button-wood. *Platanus occidentalis.*
26. Sumach. *Rhus glabra.*
27. Yellow locust.
28. Black walnut. *Knarl.*
29. Hickory. *Juglans sulcata.*
30. White ash. *Fraxinus Americana.*
31. Live oak or navy oak. *Quercus virens.*

Observations upon the best methods of Packing Seeds for a voyage to India or China. By ROBERT FORTUNE.

When I was about to leave England for China in the spring of 1843, I was desired by the Council of the Horticultural Society to procure a quantity of seeds, and to have them put up in different ways, in order to test the best methods of packing such things for a long sea voyage to a distant country. Messrs. Wrench and Sons, of London-Bridge, supplied a large portion of the seeds, the remainder were made up in the garden of the Horticultural Society. In order to make the experiments as complete and satisfactory as possible, the same kinds of seeds and from the same samples were packed in three different ways. One lot was put up in bottles and sealed; a second was packed in paper and put into a box lined with tin; and a third was merely put in paper, and thrown loosely into a canvas bag to be hung up in my cabin. When I arrived at Hong-Kong, Messrs. Dent and Co. kindly placed their garden at my service for any experiments of this nature which it might be necessary to try. It was in the month of July, and the rays of the sun were too fierce, and the ground too dry, for the purposes of securing a crop; but a certain portion of the seeds was immediately unpacked and sown for experiment in a corner of the garden which was partially shaded by the house.

On examining the seeds in the sealed bottles, I observed that many of them were moist and mouldy; in some instances they appeared to have swelled to a certain extent, as if vegetation had been commencing; in other bottles they were perfectly dry, and seemed in good condition. The results were as may be expected; those seeds which were taken out of the mouldy samples all failed to vegetate, while the others came up well enough. Although I think the system of sending out seeds in sealed bottles is a bad one and ought never to be adopted, yet they might be sent out in this way in good order, provided the air in the bottles was well dried, and the seeds also, before being packed. But it is a difficult matter to dry thoroughly certain kinds of seeds which contain a large quantity of albumen. In the passage to India, China, or Australia, the temperature is often changed; at one period the seeds are broiling in a high temperature under the line, a few days afterwards they are in a cold damp atmosphere, when the vessel is running down her "easting" far to the south of the Cape of Good Hope. In the case of India and China, the seeds again cross the line before they arrive at their destination. When in a high temperature, every particle of moisture is drawn out from the seeds into the bottles, which become little stoves or Ward's Cases for the time, and in which the first stage of germination commences. Other circumstances, however, are not favorable, and the vessel in the mean time sails onward in her course towards colder latitudes, vegetation is checked, a mouldiness ensues, and the vital principle of the seeds becomes extinct. This is what really takes place when seeds are packed in sealed bottles not perfectly dry, and, as this system of packing has no advantages which I know of, it is much better never to adopt it.

Those seeds which were taken out in boxes lined with tin were nearly all in good condition; so were those which were packed loosely in a canvas bag and suspended in the cabin. I have already said that the season at Hong-Kong, when I arrived there, was too hot for English seeds. After sowing a few for the purpose of experiment, the remainder were taken to Chusan and the other northern ports which I visited at that time. Dr. Maxwell, of the Madras army, had a small garden on the island of Chusan, which he rented from the Chinese. Here a great many of the seeds were sown, and the results as regards their vegetation were the same as I have already related, and confirmed the experiments made under unfavorable circumstances at Hong-Kong. But the climate of Chusan being much more favorable to European seeds, they not only vegetated, but grew afterwards with great luxuriance.*

Each of these two modes of packing has its peculiar advantages. Seeds, of course, can be packed more securely in tin for a long voyage, but when this mode is adopted they should be carefully dried, as well as the paper in which they are put up, before the box is closed. The method of packing in canvas bags, which are hung in a cabin or other airy part of the vessel, is the best of all, because any moisture which may evaporate from the seeds or paper during the voyage can readily pass into the air. But it is often difficult to induce captains of ships or others to allow packages of this kind to be swinging about in cabins, and unless some one can be got to take charge of them who can be depended upon, I should prefer the mode of drying the seeds well, and packing them in a box lined with tin.

Another matter of equal importance as regards success is the age of the seeds. Old seeds in many instances are almost sure to fail. Even in this country, where seeds can be kept in the most favorable circumstances, many will not vegetate the second year. In sending them to distant countries, therefore, where they will have to pass through many changes of temperature, none but those of the last gathering should be sent. The Honorable East India Company, with that enlightened liberality which does them so much credit, kept up a large establishment at Calcutta for the purpose of procuring and sending the natural productions of India to England. For many years scarcely any of the seeds thus sent would vegetate when they reached this country. At last the reason of this want of success was solved. A young man from the Calcutta garden having been sent over to England for the purposes of improvement, was asked to explain the method of preparing these seeds for exportation. It came out that seeds were gathered year after year and stored in the same drawers; that, in fact, the young seeds were always mixed with the old ones which remained from former gatherings. When parcels were ordered to be made up for Europe these drawers were opened and the seeds taken out of them. Of course the packages so made contained a great portion of seeds which had been gathered years before, and whose vitality was much weakened or altogether gone.

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* The natives, who had never seen any peas but the common field kinds, were much surprised at the growth of our English ones, which in this favored climate attained a much greater size than they do at home. As the stems grew in height, the Chinese, with their characteristic conceit, told us that their own kinds were much better than ours, for that ours would produce nothing but stems and leaves. But when, in due course, the fine tall rows were covered with a sheet of white bloom, and when the large pods began to swell, the Chinese were fain to beg a portion of the produce to sow in their own gardens. These, with many other seeds, were given to them with much pleasure, and it is hoped are now cultivated to some extent—unless, indeed, they have been destroyed as belonging to the "barbarian," at the time the comfortable houses and hospitals were pulled down, which were left in good condition by the English when the island was restored in the spring of 1846. It is a curious fact that the moment the place was evacuated the Chinese began to pull down the houses erected at considerable expence by the English during their residence on the island.

Before seeds are packed for foreign countries, they should always be looked over, and those infested with insects carefully removed. These little animals make sad havoc amongst a packet of seeds during a long voyage.

From what I have stated it will be observed, that the length of the voyage, the dampness of sea-air, the variations of temperature, and the attacks of insects, are the greatest difficulties we have to contend with in the exportations of seeds to distant countries. These however, may be in a great measure overcome by attending to the directions I have given for the preparation of the seeds. I may mention that by far the best way of sending small boxes of seeds to India or China is by the overland route, viâ Southampton. The expence of sending any box of small dimensions—say a foot, or a foot and a half, cubic measurement—by this conveyance will be less than its freight would be if sent by ship round the Cape; it will reach its destination in half the time, and the variations of temperature will be less. The post-office can also be used with great advantage in sending out small packets of the choicer kinds of seeds, and there is no plan which is more likely to be successful than sending them in a letter. A letter weighing an ounce will only cost two shillings, and may be made to hold a great number of interesting seeds for which a friend in the East would gladly give two gold mohrs; and if, in conclusion, I might give a word of advice to those who have friends in distant countries as to the kinds of flower-seeds which will prove most acceptable, I would say, send above all those common things which, from time immemorial, have been favorites in our woods and gardens. They will be prized much more than any thing which we consider new or rare. A friend of mine, who has a garden in one of the northern Chinese towns, and to whom I sometimes send plants and seeds, writes thus:—"Send me some roses of various colors, but amongst them a plant or two of those *friends of my youth*, the cabbage and moss."—*Journal of the Horticultural Society of London, Vol. iii, part I.*

View of the State of Agriculture in the British Possessions in the Straits of Malacca. By J. Balestier, Esq., *Corr. Mem. of the Am. Institute, Member of the Academy of Rhiems, &c. &. &c.*

Before entering on the following rapid survey of agriculture in the British possessions in the Straits of Malacca, it may be well to say a few words regarding the physical and political conditions of the country.

The "Straits' Government" embraces the island of Penang (Prince of Wales' Island) and its adjacent Province Wellesley, on the Malayan Peninsula; the island of Singapore and Malacca, situated like Province Wellesley on the mainland. The three Settlements lie on the easterly side of the Straits of Malacca, occupying as many unconnected spots from Lat. 1° 17′ to 5° 25′ North, and 100° 25′ and 104° East Long.

Each of the three Settlements has a presiding magistrate, under the name of Resident Councillor, and over them presides a Governor, appointed, as the Resident Councillors are also, by the Governor General in Council of India. The Straits' Government is subordinate to the Government of Bengal.

The aboriginal population consist of Jakoons, a people quite in a state of nature, who are the tenants of almost impenetrable forests, and of Malays more or less civilized. To set down the population of the country at one person per square mile is not thought to be an under-estimate by those who have had the best opportunities of judging after exploring the interior. This estimate of course does not refer to the large towns in the occupation of Europeans.

The climate of the Straits is rather more humid than dry. There can hardly be said to be, as in most other tropical countries, a dry and a wet season, and hence an agreeable temperature and continual verdure prevail throughout the whole year. The thermometer ranges from 70° to 85°, and even down as low as 66° in the cool nights in January.

The general character of the country has been described by one whose means of inspection have been considerable, and whose geological attainments constitute him a competent judge, thus:—

"The elevated parts of the Straits' Settlements are composed either of plutonic (principally granitic) rocks, or stratified clays, shales and sandstone, varying in their texture and composition, and frequently impregnated with iron. The island of Penang is one granitic mass, which changes its mineralogical, and consequently its agricultural character, as we proceed from the north to the south. From the surface of the channel and of Province Wellesley many low hillocks and ranges rise, some of which are granitic and others sedimentary. Malacca (including Naning) and Singapore consist of groups and ranges of hills amongst which long and narrow vallies ramify. Granite and allied plutonic rocks are largely developed, forming extensive tracts in the Malacca territory, and, contrary to the opinion that has generally prevailed, composing the larger part of Singapore. The plutonic action which the sedimentary rocks have undergone in a greater or less degree has, in many places, veined and impregnated them with iron, and some times so largely as to give them a completely iron-masked or lateritic character, a circumstance very necessary to be remarked in an agricultural point of view.

"The vallies and plains are for the most part alluvial, and consist chiefly of clay. Amongst this sand appears occasionally forming bands of some breadth, but more often extending in long narrow zones, raised a little above the level of the clayey flats. Where swamps have been formed by such sand belts banking in the water, vegetable matter has been accumulated. Its depth is regulated by the level which the clay or sand flat that has been banked in had previously attained, and in different localities varies greatly. Where new, it consists of fragments of wood and masses of aquatic plants, more or less decomposed, and where old, of a soft, black, peaty matter, spongy and elastic at the surface, and below passing into a thick vegetable mud."

From which description it will be inferred, that the soil is generally good, which will be readily admitted on seeing the gigantic trees and the thick underwood, of which the interminable forests are composed of, along the whole coasts from Johore to Province Wellesley, a distance of upwards of four hundred miles.

Until very recently Europeans had done little in plantations of any kind. In the early part of the present century, the high prices which spices bore, induced several Europeans to commence the cultivation of pepper, nutmegs and cloves on the island of Penang, then recently ceded to the East India Company, and made a principal place of stoppage for their ships trading to China. But subsequently a long period of uninterrupted peace induced larger productions of these products, and consequently lowered their value, which, together with the very high pretensions of the Company for the occupation of waste lands, deterred enterprising Europeans from applying for them. But after some years a modification of the terms, with the prospect of a diminution of duties on sugar, led to the establishment of considerable sugar plantations in Singapore and Province Wellesley under European management. The boon obtained by the last named place in having her sugar and rum imported into the home markets, on payment of the reduced duties, encouraged the extension of cultivation there, whilst the denial of the same advantage to Singapore at once checked any further efforts in sugar cultivation.

So recently as 1843, the official reports of Penang show, that only 353 cwt. 3 qrs. 10 lbs. of sugar and 4,000 gals. of rum were exported, whilst the records of the same office exhibit the following subsequent reports of exports, viz.,—

1846, from 1st July to 31st Dec. 13,000 piculs sugar, 10,040 gals. rum.

1847, from 1st July to 30th June 28,500 piculs sugar, 13,000 gals. rum. and from 1st July to 31st Dec. the exports were estimated to be—

35,200 piculs sugar.
59,000 gallons rum.

In the course of a very few years, the exports will probably rise to about 1000,000 piculs, when, as all the territory under the jurisdiction of the East India Company will have been taken up and under cultivation, no more ground will be available unless a further cession of territory should be asked for by the Indian Government, and ceded to them by the chiefs of the adjoining native states.

In the meanwhile nutmeg, cocoanut and rice cultivation have been on the increase on the island of Penang and in the Province, which, with the returns of the cane lands, have made of George Town, so recently wearing the internal signs of decay, a bustling and flourishing mart.

The natural fertility of the soil in Province Wellesley, which generally is level and little raised above the adjacent sea, assisted by abundance of fish, bat-guano and other manures, of which the Chinese avail largely, cause large returns from the land, amounting in some instances to three tons of raw sugar or *gour* per acre. The cultivation of the cane is generally carried on by Chinese, who yearly emigrate in large numbers, from Amoy chiefly, and who let themselves out for one year to Europeans or to Chinese cane-growers, at from three to four Spanish Dollars per month, they finding themselves in food, clothes, &c. The Chinese, for the most part, manufacture a coarse quality of sugar, called jaggery, but they generally prefer to contract with Europeans who have mills and apparatus for manufacturing sugar and rum, to deliver to them their canes at from one and a quarter to one and a half Spanish Dollars per picul of the *gour* made therefrom. As planted canes are from twelve to fourteen months before they are ripe, and rattoons from ten to eleven in the Straits, the planter gathers two full crops in two years. Many laborers come also from the Madras side of India, who let themselves out on the estates, and are more prized for various kinds of plantation works than as cane cultivators.

Both in Province Wellesley and at Singapore, sugar is manufactured by Europeans after the West India process. Almost every estate is provided with steam or water power to express the cane, and the juice is concentrated in coppers of various forms, placed in ranges, under which the dried expressed canes are used as fuel. Rum is also made as in the West Indies.

Neither the plough, the harrow, nor any other agricultural helps are in general use; the hoe being the only implement of husbandry employed by Chinese, or Malay or Kling coolies in the Straits, with the exception only of one estate where European implements are used,—and hence the great number of laborers employed on a comparatively small extent of canes. Two and a half acres is the most that a Chinaman cultivates in the year, and even this little is only obtained by hard driving, if working on monthly wages for a European. The returns from which would be about forty piculs of dry sugar, whilst in Louisiana, in the United States, where implements of husbandry adapted to this culture are freely used, and notwithstanding the immatured condition of the canes when cut,—which, owing to the cold season, are obliged to be manipulated before they are ten months old,—each hand, or laborer on the estate, men, women and children, able to work, produces from five to seven hhds. of sugar, of about one thousand pounds each, according to the returns made to and published by the Congress. A quantity truly enormous, considering that from twenty-five to thirty per cent. of the laborers on a sugar plantation are either idlers so called (persons employed at various works out of the fields) or disabled by sickness. But the contrast between Louisiana and Java, in the extent of production according to the number of laborers, is still greater than here, for, according to "Temminck's General view of the Dutch Possessions in the Indian Archipelago," not less than 2,440 men are variously employed in producing a crop of 6,000 piculs of sugar on an estate of 400 bahus or bouws, which is about equal to an English acre. The same writer states, the price of field labor at $\frac{12}{001}$ of a Dutch florin, equal to one cent. and a half of a dollar per day and food not found.

This immense economy of manual labor in Louisiana shows but too clearly the advantage to be obtained in the use of suitable helps and implements. Sixty stout mules, thirteen ploughs, and about a hundred and fifty hands or slaves, suffices for the cultivation of six hundred acres of canes, and two hundred of Indian corn, besides cutting a sufficiency of wood for the steam engine, and range of concentrating coppers. But manual labor is not wasted there as in most of the sugar growing countries, particularly on this side of the Cape of Good Hope. There, the drills or furrows are opened with ploughs, there the grasses and weeds are extirpated by the same implements or by harrows, there the banking of the canes so slow in turning up, and so expensive in making here, is done with a subsoil plough, which not only throws up a bank for the present purpose but brings up to the surface, there to remain exposed to the influence of the atmosphere for some months a fresh body of earth held in readiness for the next crop. With these appliances, and with thorough drainage where needed, it is that the Louisiana planters obtain from unripe canes, in a season of nine or ten months, more than double the quantity of sugar from a given extent of ground than in any place within the tropics.

The cultivation of the land as a business, except in raising paddy or rice, cannot be said to exist at Malacca. Nothing indicates that the Portuguese or the Dutch paid any attention to the soil, for there remains no vestige of any attempt at cultivation. And yet there is under British jurisdiction one thousand square miles of land well adapted to almost every description of tropical crops, and which almost wholly remains in a state of nature. Around the town of Malacca, for a few miles are extensive paddy fields planted chiefly by Malays, but elsewhere not a plantation is to be found. The Chinese, natives of the place, who resort to Singapore in search of fortune, and who as merchants, shop-keepers, and brokers, are the life of that commercial town, after a successful career return, whilst yet under middle age, to their *Elysium*, their beloved Malacca, to pass the remainder of their lives. But here they are as inactive as they were stirring at Singapore, and instead of seeking occupation by investing a portion of their wealth in rearing plantations of spices, sugar, paddy, or any thing else (for there is at present no commerce in the place), they build splendid dwellings in a close and crowded district of the town, and in an impure atmosphere the remainder of their days are passed without following any serious occupation. Such is Malacca at this day, in an agricultural point of view.

The hard conditions formerly imposed by the East India Company on their tenants, as has already been stated in the first part of this paper, kept back European enterprise at Singapore as at the other end of the Straits. But however, a few Europeans and many Chinese ventured to make settlements in the interior of the island, hoping for a more liberal policy.

The Chinese undertook the growth of gambier and pepper, and gradually have extended themselves over a considerable portion of the island. But they are evil doers rather than doers of good to the land, which after a few years' cultivation they abandon, impoverished and overrun with *lalang* grass, and remove to a fresh clearing in the jungle, where the virgin soil becomes in its turn exhausted and a nuisance.

The emigrants from China who yearly arrive here are of the very lowest classes of laborers in their own country, and for the most part enter into engagements with their countrymen already established here to labor for one year, in consideration of the payment of their passage money hither. At the end of the year, if perchance they have not quietly emancipated themselves before, they are free to do as they please, and as they are mostly taken up by the gambier and pepper planters, they usually bargain with a Chinese shop-keeper in Singapore for money and provisions to enable them to set up with, pledging the future plantation and its products on conditions highly favorable to the capitalist. After having found a suitable location they squat upon it, not unfrequently without even applying for a license or cutting paper from the local authorities, a clearing is soon made in the forest, a part is planted in gambier and a part in pepper, the fallen trees being preserved for future use in boiling the leaves of gambier into a strong decoction, which on cooling hardens somewhat in appearance to soap. Now the pepper vine, to be vigorous and productive, requires a good deal of manure, and the exhausted leaves of gambier are carefully preserved to be afterwards deposited at the roots of the pepper vines, and this is the only manure they receive, while to the gambier plants none whatever is given. The ground is gradually impoverished; becomes less valuable; *lalang* soon begins to show itself among the plants; as the cultivator is not the proprietor, but a squatter, and as he has abundance of fresh ground at hand, and believing it to be more for his interest to begin a new plantation than to be at the expence of procuring manure to keep the old one in good order, it is not a matter of wonder that he should remove from place to place, and, as the locusts, leave a tract of desolation behind him.

The Europeans who commenced plantation of nutmegs, cocoanuts, and sugar-canes, have been put to great expence in extirpating the *lalang* left by the Chinese who preceded them, and as their pernicious practice is still continued, the heavy outlays required to put the ground in a fit state for planting will tend to discourage and retard European enterprise.

There are several extensive estates of nutmegs owned by Europeans in the island in a very thriving condition, and more are yearly added. The spice grows best in the red soil of the hills, and to increase the products, large quantities of rich manures are given to them, once in two or three years.

The great attention the trees receive in the Straits has a very beneficial effect on the nuts, which are large and of a much esteemed quality in the markets of the west.

No success has attended repeated trials of cloves here; until the trees reach the age of bearing they grow and look extremely well; but any expectation of a crop that may have been raised by their hitherto fine condition ends in disappointments, for just then the trees assume the appearance of sudden blight as if lightning striken, and they die.

Cinnamon is much more successful, for wherever planted it grows most luxuriously, but as no one has yet made a business of preparing it for the market, its quality remains unknown.

The article which, next to nutmegs, has arrested the attention of Europeans, is the cocoanut tree, of which there are many extensive plantations in a very flourishing condition, holding out favorable prospects to the proprietors. Hitherto the island has been supplied almost wholly from abroad with nuts and oil for its consumption, which will before long be obtained from her own soil.

Sugar cultivation was commenced on the island ten years ago, and has remained stationary since, for the two plantations then commenced remain still the only ones. The cause of this pause may be mainly attributed to the higher rate of duty charged in Great Britain on the Singapore grown sugar than on that manufactured in other British Colonies, and this heavy difference is imposed because foreign sugar, like every other article of commerce, is freely admitted into the port, as if it could not easily be ascertained and certified by the local authorities of the place which is the genuine production of the island. Another cause for its non-progress is the want of adequate capital to carry on the business on a large scale. From the beginning an impression has prevailed that neither the climate nor the soil were favorable to the cane, consequently no money facilities are obtainable in the shape of advances on growing crops or time loans. But to those acquainted with the matter the objections alleged will appear to be mere prejudice unsupported by facts, for if, in taking note of the climate, neither long protracted droughts, nor continuous seasons of wet, are heard of, nor hurricanes, nor typhons, and if a soil changing from red clay more or less mixed with sand, to fields of peat overlaying beds of blue clay filled with marine shells of various sorts be observed, if the observer does not class this soil as the very best, he will be apt to pronounce it, at least, good; more particularly if, on proceeding with his observations, he sees continuous fields of canes measuring from six to eight feet in the stem; which, when ripe and expressed, yield a fair quantity of juice, marking from 9° to 11° of Baume's saccharometer. A practical observer will not be apt to issue a decree of condemnation against the cultivation when, besides, he ascertains that the natural circumstances of the country allow of the taking of two full crops in two years: viz., one of planted canes in fourteen months, and one of rattoons in ten months; and neither the quality of the sugar or rum obtained from the canes will lessen the favorable opinion he may have formed; for the sugar he will observe in the London price current classed with that from Jamaica, and obtaining in that market the same price, and the rum his own judgment will place on an equality with that from the above-named island, and no doubt would be equally valued in the home market if its sale for consumption there was allowed. But the foreign duty is charged on it which amounts to a prohibition. Singapore being thus circumstanced, it ought not to appear extraordinary that sugar cultivation has not been progressive.

Although indigo is extensively used by the dyers of cotton fabrics here, yet it is little cultivated in the island, where it might be produced extensively, for the seeds thrive luxuriantly and abundantly wherever sown. Three crops have been reaped in a small experimental field sown with

Bengal seeds, and probably, with more attention than the experiment received, four cuttings might have been had in the year.

Singapore is celebrated for the great abundance and excellence of its pine-apples, which may be obtained during nearly the whole year, and from which, if the accounts published from time to time of the value of the silky thread obtained from the leaves are to be depended upon, a valuable article of export might be gathered.* The small circumjacent islands, are quite covered with fields of this plant; the fruit only is of any value to the Chinese cultivators, whilst hundreds of tons of the leaves are annually allowed to waste by slow decay on the ground.

Some notice has already appeared in the Journal, of Gutta Percha,† a new product from the Straits, which has attracted much attention, and which daily becomes an article of greater commercial value.

The forests of Singapore have been pretty well cleared of the tree which the Malays cut down in order to come at the milky substance which, when boiled in water, turns into this solid substance, and the same imprudent and reckless people are now ransacking the woods of the Peninsula with every prospect of destroying the last remnant of the tree before long.‡

Many specimens of other products of intertropical regions are to be seen in a thriving condition in the Straits, leading to the conclusion that, if attended to on a large scale, adequate qualities would be obtained. Coffee alone is said not to be remunerative, owing, as is alleged, to the wetness of the climate which keeps the tree in a bearing condition all the year round, thereby decreasing its productiveness. It is certainly true that the trees yield fruit with very short intermissions throughout the year, but how far this objection is valid is not so clear as the same objection might be made to nutmeg trees, which also are in constant bearing, but nevertheless yield abundantly. It remains yet to be seen, what has not yet been tried in the Straits, whether the cultivation of coffee under the conditions required in other countries, viz.: in rich, virgin, hilly soil, and protected by the foliage of larger trees from the burning rays of a vertical sun, will not give, more especially in the interior of Malacca, the returns usually obtained from the plant in other places.§ The few trees planted here and there produce beautiful small blue beans, the quality the most in favor in commerce, which makes it to be regretted, that as yet no serious and well directed attempt has been made to cultivate it extensively.

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* A small quantity is annually prepared and exported to China, as we accidentally discovered some time ago. Some notes which we made on the subject will be given in the Journal. —ED. J. I. A.

† *Ante*, Vol. i. pp. 22, 261.

‡ But see the remarks *ante*, Vol. i. p. 263.—ED.

§ An experiment of the kind was made in Penang, and so long as the constant attention which such experiments require, could be given, it was quite successful. The ultimate result is still uncertain. We hope that our local readers will favor us with accounts of all such experiments. There is not a cultivated plant in the Straits of which the habits and culture have been fully described, and no contributions would be more interesting and useful than accounts of these. We are promised papers on the nutmeg and cocoanut, and we hope all our other cultivated trees and plants will be successively described by gentlemen who have given their attention to them.—ED.

Sanguine expectations were at one time entertained of raising cotton on the island, and considerable expence was incurred in giving it a fair trial. But the magnificent reports of coming crops sent to the Agricultural Society of Bengal, and the cheering reports of the London brokers to whom trifling samples had been sent, were doomed to a short life, for although the cotton plants of almost every known species were tried, and grew well, still they yielded but few pods, and these were for the most part mildewed, and consequently not merchantable.* The fact is, the climate is too damp generally for maturing a fibrous and delicate substance, requiring continuous dry and hot weather.

But as has been already observed, agriculture has scarcely been introduced in the Straits. What little is done in planting is done without reference to art or science. The hoe is the implement in universal use, slow and expensive, whilst the rapid and economical plough is wholly overlooked. Neither is the composition of manures attended to. But wherever fish, or bat-guano, or a dead horse or an old cow is to be readily got, it is carted to the field and immediately applied as a fertilizer, without admixture and decomposition with other nourishing substances, by which the quantity would be increased a hundredfold.

The time is, however, fast approaching when enterprise and skill will reach the Straits. Its fertile soil, its rich and abundant tin and gold, its fine rivers opening extensive and frequent communication with the interior, the facility of obtaining cheap labor from India and China, and above all, its temperate and very healthful climate, will invite settlers, who, undertaking agriculture as a business, will avail themselves of the improvements of the day, and not let them remain as now, a dead letter.—*Journal of the Indian Archipelago, for March,* 1848.

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* A full account of this attempt to introduce cotton would be highly valuable. All such experiments, whether successful or unsuccessful, have a permanent importance, not only for the Settlements, but for the extensive adjacent countries which partake in similar general conditions of climate.—Ed.

Result of a trial made at the Society's Garden on a small assortment of Cereal Grain Seeds and Flower Seeds, forwarded by Dr. Royle.

In the early part of February 1848, the Society received from the India House, by overland conveyance, two assortments of grain seeds and one of flower seeds: of the former one box was placed in the hold of the steamer, the other was taken charge of by Dr.

Falconer, and kept in a loose airy portmanteau in his cabin, nearly all the voyage, after crossing the Bay of Biscay; with the view of ascertaining how their germination would succeed as compared with those sent in the closed mail boxes. The flower seeds were also entrusted to Dr. Falconer's care, and placed in the same box with the cereals. No time was lost, on receipt of these seeds, in sowing them, and the following statements, drawn up by the Society's gardener, show the comparative results:—

ENGLISH CEREAL GRAINS.

Names.	Date of sowing.	Date of germination.	Number of seeds germinated up to this date.
Cereals kept in the Cabin.			
Sprat or Battledore barley, ..	Feb. 21st,	Feb. 27th,	1st March, 92 ⅌ cent.
Common rye or Bere ditto, ..	,,	,,	29th Feb., 98 ditto.
Italian ditto, ...	,,	,, 25th,	,, 94 ditto.
Victoria Bere ditto, ...	,,	,, 26th,	,, 91 ditto.
Common winter ditto, ..	,,	,, 25th,	,, 93 ditto.
Rattling Jack wheat,.. ..	,,	,, 26th,	,, 85 ditto.
Bengal spelta ditto, ...	,,	,, 27th,	,, 53 ditto.
Chiddam ditto, ...	,,	,,	,, 93 ditto.
Caucasian ditto, ...	,,	,, 26th,	,, every seed.
Ishmael white-bearded ditto,	,,	,,	1st March, 93 ⅌ cent.
10 kinds, averaging 79 ⅌ cent.			
Cereals kept in the mail boxes.			
Oat, ...	Feb. 21st,	Feb. 27th,	1st March, 35 ⅌ cent
Wild grained ditto, ..	,,	,, 28th,	,, 60 ditto.
Dutch early ditto, ..	,,	,, 26th,	,, 70 ditto.
Victoria Bere barley,	,,	,, 25th,	29th Feb., 94 ditto.
Sprat or Battledore ditto,	,,	,, 26th,	1st March, 88 ditto.
Italian ditto, ...	,,	,,	,, 49 ditto.
Common rye or Bere ditto, ..	,,	,, 25th,	28th Feb., 99 ditto.
Caucasian wheat, ..	,,	,, 26th,	29th ,, 94 ditto.
Rattling Jack ditto, ..	,,	,, 26th,	29th ,, 94 ditto.
Ishmael white-bearded ditto,..	,,	,,	1st March, 67 ditto.
Bengal spelta ditto, ..	,,	,, 27th,	,, 61 ditto.
Chiddam, ...	,,	,, 25th,	29th Feb., 98 ditto.
12 kinds, averaging 75 ⅌ cent.			

ENGLISH FLOWER SEEDS.

Names.	Date of sowing.	Date of germination.	Number of seeds germinated up to this date.
1 Godetia rubicunda, ..	Feb. 22nd,	1st March,	15th March, 23 ⅌ ct.
2 Malope grandiflora, ..	,,	27th Feb.,	,, 46 ditto.
3 Clarkia pulchella, ..	,,	4th March,	,, 18 ditto.
4 Rhodanthi Manglesii, ..	,,	10th March,	14th ,, 3 ditto.
5 Godetia lepida, ...	,,	29th Feb.,	15th ,, 64 ditto.
6 Gilia tricolor, ...	,,	25th ,,	,, 71 ditto.
7 Calliopsis Drummondii, Texas, ...	,,	1st March,	,, 26 ditto.
8 Collinsia bicolor, ..	,,	2nd ,,	,, 11 ditto.
9 Ribes sanguineum, ..	,,	,,	None.
10 Fedia grandiflora, ..	,,	29th Feb.,	15th March, 36 ditto.
11 Dianthus barbatus splendens, ...	,,	,,	,, 54 ditto.
12 Viscaria oculata, ..	,,	,,	None.
13 Collinsia grandiflora, ..	,,	7th March,	,, 3 ditto.
14 Hibiscus Africanus, ..	,,	27th Feb.,	,, 33 ditto.
15 Clarkia elegans, ..	,,	3rd March,	,, 35 ditto.
16 Lupinus pubescens, mixed,	,,	29th Feb.,	,, 39 ditto.
17 Lobelia gracilis, ..	,,	2nd March,	,, 20 ditto.
18 Polemonium cœruleum grandiflorum, ...	,,	3rd March,	,, 25 ditto.
19 Verbascum Phœniceum,	,,	2nd ,,	,, 78 ditto.
20 Collomia coccinea, ..	,,	3rd ,,	,, 5 ditto.
21 Pentstemon ovatus, ..	,,	,,	,, 17 ditto.

Averaging 32 per cent.

A. & H. SOCIETY'S NURSERY, H. C. BOT. GARDEN :
16th March, 1848.

NOTE BY DR. FALCONER.—On this occasion, the average results are very favorable ; in both cases the difference is in favor of the seeds brought out in my cabin, as compared with those enclosed in the mail boxes : but it is so inconsiderable, (79 : 75 per cent.) that the amount is fairly within the range of the ordinary contingencies of germination. I observe, that all the flower and shrub seeds have come up except *Viscaria oculata* and *Ribes sanguineum.* The failure of the latter appears to be a constant occurrence. I have often had it sent to me from the India House, but I do not remember having succeeded in getting it to grow.

Mode of preserving grain in the Nerbudda Valley. Communicated by Col. J. R. Ouseley.

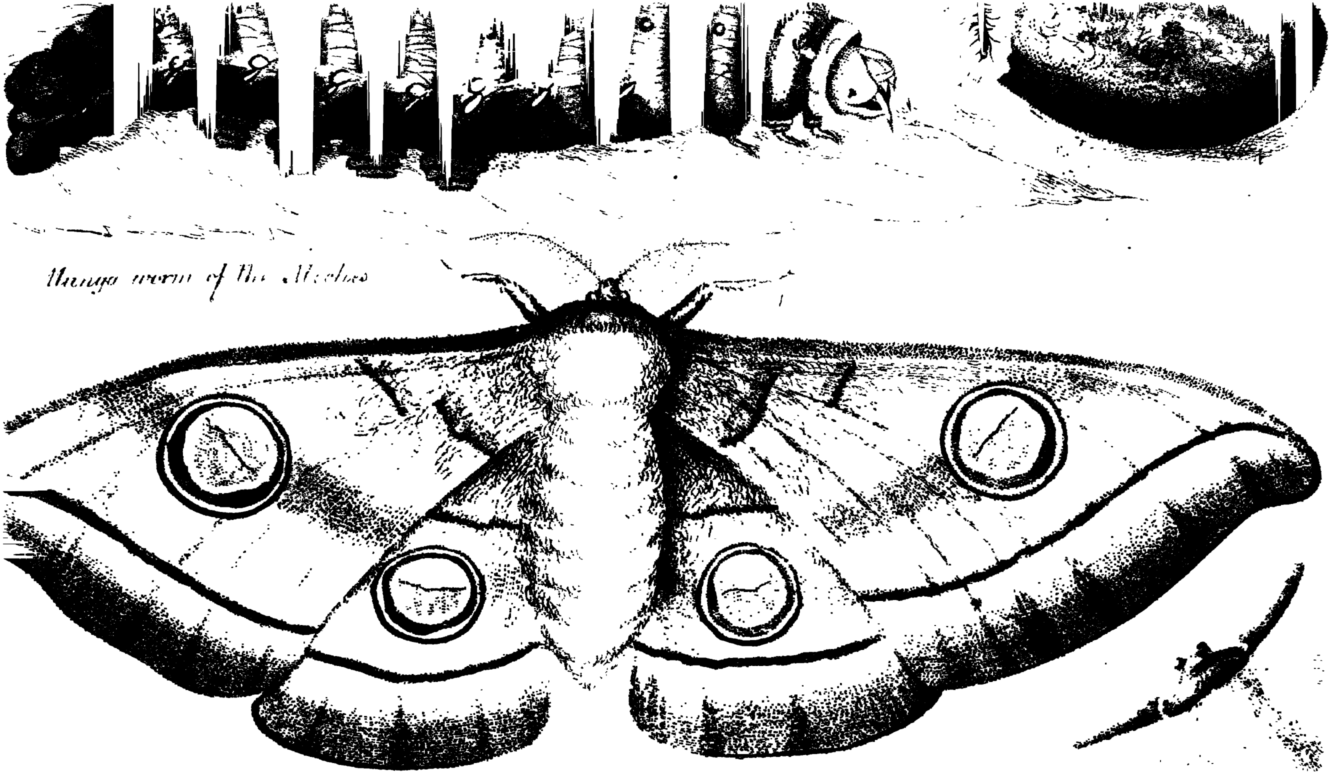
On the banks of the Nerbudda, wheat is kept in *bundehs* or pits, containing from 500 to 2,500 maunds. They are shut up soon after the harvest, and covered over with earth; the bottom, sides, and top being lined for six inches with *boosah,* or chaff, retained between leaves and the earthen sides. The leaves are dried and put up on edge, filling in the chaff between the earth and the leaves as the wheat is filled in, the depth about from 5 to 7 feet, and in proportion wider as the *bundeh* may be required for more or less grain. If unopened it keeps without being attacked by any insects, or becoming tainted, for several years; but fresh wheat is used for sowing. A high dry place is always selected for a *bundeh,* which has no other roofing than the earth piled several feet, and beaten down in a conical form, so as to allow of the water running off. Here and there a thatch is put over the *bundeh.* Boot-gram is also kept in the same way, and other grain.

Recipe for preventing the ravages of the Corn-Weevil.

TO THE EDITOR OF THE ECONOMIST

Sir,—Your correspondent enquires how to destroy the weevil. Our case may be useful to him. Some years ago, we found a house overrun with weevils; after numberless attempts to destroy them, we were led to observe, that they were almost entirely on the south wall (our [illegible] side), and that they appeared to breed in incredible numbers in any unusually damp spot or corner. Taking the hint, we cased the wall on the outside with slate, and made the house in every respect perfectly dry, and in a short time the weevils died off and disappeared. Since adopting this precaution, we have not had the least trouble, and have only been reminded, that such an insect exists when an accidental spot of damp has appeared to generate them again. We think ourselves, therefore, entitled to say, that these insects require moisture, and that if the grain and granary, as both ought always to be, are dry and healthy, weevils will not long remain. This plan has the merit of costing less than nothing, because the injury that corn sustains directly from damp, is more than equivalent to the expence of keeping premises dry, leaving its indirect influence in the generation of weevils out of the question,—we are your obedient servants.

Wiveliscombe, Somersetshire : W. & W.
October 5*th*, 1846.



Mango worm of the Meches

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DECEMBER 31*st*, 1848.

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The Binder is requested in binding up this Volume to transfer the Plate of the wild silk-worm in the present Number to page 167.

THE JOURNAL

Agricultural & Horticultural Society

INDIA.

Notices regarding the plants yielding the fibre from which the Grass-cloth of China is manufactured. Communicated by DR. D. J. MACGOWAN.

[In consequence of communications received last year from Dr. Campbell, Superintendent of Darjeeling, and Mr. T. F. Henley, (v. Journal, Vol. vi. part 1, p. 30) respecting the superior character of the fibre of the *Kunchoora* of Rungpore, (*Urtica tenacissima,* Roxb.) in which some observations were made regarding its probable identity with the plant yielding the material for the well known and valuable "grass-cloth" of China,—the Society was induced to refer the matter to Dr. Macgowan, at present stationed at Ningpo, to whose obliging kindness it is indebted for the following interesting particulars, which have been obtained partly by correspondence with scientific friends in other parts of the empire, partly by consulting botanical works and enquiring among the natives, and also from personal observations. It is worthy of remark, that the Society's museum contains several specimens of the fibre of *Urtica tenacissima,* in various stages of manufacture, received from Assam and Cachar, where it is known by the name "*Rheea;*" from the Shan country, where it is called "*Pan;*" and from Ava and the Tenasserim provinces. The plant is commonly met with in those countries; and it is also found in the Straits' Settlements, where it is called "*Ramee.*"

(v. Low's work on Penang and Province Wellesley.) All the correspondents of the Society, from whom specimens have been received at various intervals during the last ten years—Major Jenkins, Mr. Landers, Colonel Burney and Major Macfarquhar, speak in the same terms respecting the great strength, durability and fineness of this fibre. The Shans are stated to use it for every kind of cordage, but the Assamese and natives of Rungpore and Dinagepore, employ it merely for manufacturing into towing lines and fishing nets. The success which has attended the experiments made in Leeds and other towns in Great Britain to manufacture cloth from a mixture, in about equal proportions, of Chinese grass and sheep's wool, having led to a great demand for the former article, in a raw state, it becomes an useful subject of enquiry whether the *Kunchoora* of Rungpore, and *Rheea* of Assam, could not be made a profitable article of export in competition with the China material.]

To JAMES HUME, ESQ., *Honorary Secretary to the Agricultural Society.*

SIR,—The inquiries you have done me the honor to propose in behalf of the Agricultural Society of Bengal, respecting the plant from which "grass-cloth" is manufactured, embrace more than can be satisfactorily answered at the present time. The subjoined account, though meagre, and in several particulars incomplete, will be found to contain much of the information you seek. It is cultivated in this vicinity, but as it is of an inferior quality, and does not flower until autumn, my description is less complete than if written in a more favored locality, or at a more advanced season of the year.

Description and History.—Grass-cloth is manufactured from the fibres of a plant, called by the Chinese *Má;* it is a generic term, under which several varieties, if not species, are included, amongst these the *Tung Má, Pi Má, Sing Má, Tien Má,* and others are used only as therapeutic agents. Cloth is manufactured from the *Chú Má, Tá Má, Kin Má, Luh Má, &c.* There is also a species of grass-cloth made from the *Kóh:* all these have likewise a place in the pharmacopœia of China. In imitation of the native botanists from whose works this account has been mainly derived, I shall principally limit my remarks to a description of the *Chú Má,* which belongs to the natural order of *Urticeæ*—it is a *Cannabis* or hemp, but differing from *Cannabis sativa,* sufficiently to warrant another designation. Perhaps until it becomes better known, it may be called *Cannabis sinensis.* It has an irregular cellular root, of a yellowish-white color, which sends up annually ten to fifteen, or more stems, to the height of from 7 to 10 feet. The stems are upright, slightly fluted, pilous, and herbaceous: its leaves are on long petioles, alternate, ovate, roundish, serrate, simple; the upper surface pilous and dark green, the lower of a silvery-grey. The flowers are described as minute, numerous, of a light green color, on a catkin-like receptacle or spike. It is found at the base of hills and on dry soils, from Cochin China to the Yellow river, and from Chusan to the farthest west that researches can for the present extend, and abounds chiefly in Kiangsú, Sy, Chuen, Kongnain, Chikiang, Fuchkien, and Canton provinces. Native writers do not include the latter province as its region. It is certainly remarkable, that there is no notice of the *Má* in the work to which you refer, [Fortune's Wanderings in China] as it is cultivated extensively in many places visited by the author, and grows even on the walls of Ningpo. The plant is mentioned in the Chinese classics, and was undoubtedly cultivated and employed by them a thousand years prior to our era. It is mentioned in the *Shú King* as an article of tribute from the central part of China in the time of Yu, B. C. 2205: doubtless it came into use in far more remote antiquity. The Chinese *Herbal* says, "its origin is unknown."

Medical properties.—The root is described by writers on materia medica as innoxious, sweet to the taste, of a cold nature, and possessed of cathartic properties. The root, seeds, and leaves are all officinal. A long list of diseases are enumerated in which the plant is efficacious, but these throw no other light on its properties than to suggest it is comparatively inert. It is partly because of its not possessing the narcotic properties of the *Cannabis sátiva,* that a difference is presumed to exist between them. In this connection I may remark, that grass-cloth is superior to linen for garments in hot climates, the latter being a rapid conductor of caloric is often unsafe, the former is not so good a conductor, and therefore more suitable. This may be owing either to the fact of the former being hot-pressed in a calender by which it is rendered compact and smooth, whilst the process to which the other is subjected for the same purpose, but partially affects it, or original differences in the fibres of European and Chinese linen.

Planting the seeds.—This takes place in May. Great care is first taken in the selection of seeds, and in the preparation of the soil. The seed should be gathered on the appearance of frost, those produced from a recent root are the best. After being dried they are stowed away in a basket or jar mixed with sand, or dry earth, others say moist earth. The jar is then covered with straw to protect the seeds from the cold, as if exposed to its influence they yield an imperfect plant. Before planting, the seeds are tested by immersion in water, those which float are to be rejected, those at the bottom to be planted. A loose dry soil is to be selected, if near a canal or rivulet it is preferable. The ground is to be well ploughed, and broken finely, manured, and then divided into beds about eight yards long, and one wide; the beds are to be raked, and afterwards made compact with a hoe. After this it is watered and left for a night: on the following day raking up and pressing down is repeated. The beds being smooth, two or three table spoonsful of seed are mixed with a bowl of earth, and sown broad-cast over half a dozen beds, then they are swept with a broom to cover the seeds. In some places the seeds are first made to sprout, and then planted in drills, which are carefully filled up. Just before the blades appear, a framework is to be constructed over the beds, on which mats should be spread to protect them from he heat of June and July. The matting must be kept noist by day and removed at night, that the blades may receive the dew of heaven. The beds are to be constantly weeded. When the plant is about two inches high, the framework and matting may be removed. When three nches high, it should be transplanted, having been well watered the night before; the blades should be taken up separately with a portion of earth and planted in a field far removed from mulberry trees, about four inches apart. It may form a border to the ceralia and vegetables, protecting them from the depredations of domestic animals, which all avoid the *Má*. In dry weather, the field is to be watered every three or four days, until the second decade, when it may be watered every tenth day. In November and December manure it with horse or buffaloe dung, earth, straw or any rubbish, a foot or more thick, to protect it from cold. In March rake it away and expose the plant, watering it in dry weather, and using rubbish of any kind for manure. A caution is given never to use swines' dung, as it is "saltish" and hurtful to the *Má*. In the third or fourth year, some say in the second, the plant may be cut and used.

Planting the roots.—The roots are to be cut into pieces of three or four fingers' length, and are to be planted in May, half a yard apart, and watered every three or four days. On the appearance of the blades use the hoe and water them; they will be mature for cutting in the second year. In the course of ten years the roots become unfruitful, the shoots may then be cut off, and if enveloped in earth, and covered with matting, can be transplanted in places 30 or 40 inches distant. The ground should be first well prepared with manure, and freely manured afterwards: the manure being half water. Here, as before, the plants should be hoed from time to time. In many cases fresh earth, pulverized bricks, ashes, &c., are used for manure. Some years the husbandman has his crop injured by worms, he needs therefore to seek for and destroy them as they appear by picking them off. It not unfrequently happens, that the crop is in some places remarkably small, and sometimes the produce is very great without assignable cause.

Cutting the Má.—It yields three crops every year. The first cutting takes place in June. Care is to be taken not to cut the young shoots, keep therefore an inch from the ground. In a month or two, the shoots are seven or eight feet high, when the second cutting takes place: do not cut the original stem. During the latter part of September, or in October, the last cutting is performed, from which the finest cloth is made: the first being inferior, coarse, and hard. After each cutting, the plant is to be covered with manure, and watered: but not day by day unless it be cloudy. At Canton the plant is pulled up by the roots every year, from which it is evident that it differs widely from the *Má* just described. Perhaps that which is produced at Canton is *Cannabis sativa.*

Peeling the Má.—On being cut, the leaves are carefully taken off with a bamboo knife, by women and children, generally on the spot. It is then taken to the house, and soaked in water for an hour, unless it is already wet by recent showers. In cold weather the water should be tepid. After this the plant is broken in the middle, by which the fibrous portion is loosened, and raised from the stalk; into the interstice thus made, the operator, generally a woman or a child, thrusts the finger nails, and separates the fibre from the centre to one extremity, and then to the other. The stripping process is very easy. It appears to be difficult to remove the fibres from the Canton *Má,* as it is soaked in water for more than 48 hours before peeling, which is done by men. They first cut off the roots, and then separating the fibre from the stalk, strip it off by drawing it over a pin, fixed in a plank. In either process half of the fibre is taken off at one stroke. The next process is scraping the hemp, to facilitate which the fibre is first soaked in water. The knife or scraper is about two inches long; its back is inserted in a handle of twice the length. This rude implement is held in the left-hand, its edge which is dull, is raised a line above the index finger. Strips of hemp are then drawn over the blade from within outwards, and being pressed upon by the thumb, the pilous portion of one surface, and the mucilaginous part of the other are thus taken off. The hemp then "rolls up like boiled tendon:" after being wiped dry, it is exposed to the sun for a day, and then assorted, the whitest being selected for fine cloth.

Bleaching and dividing.—A partial bleaching is effected on the fibres, before they undergo further division, sometimes by boiling, and at others by pounding on a plank with a mallet. These operations are in some places repeated. After being dried in the sun, an important operation then succeeds by women and children, to whom is entrusted the tedious process of splitting the fibres, which they do with their finger nails. Expert hands are able to carry this division very far. When this process has been preceded by hatcheling, the shreds are finer and softer. The threads are formed into balls, and subjected to frequent soaking and washings. The ashes of the mulberry leaf are recommended to be put in the water with the hemp, others use lime, for a whole night. Some simply expose it to dew and sun. In rainy and cloudy weather, it should be exposed to a current of air in the house: moisture darkens it. The threads are now ready for splicing, the work of women and children, the labors of the agriculturist being concluded when the threads are rolled into balls, after being sized or stiffened with rice-water. Before the thread is ready for the weaver, the balls are steamed over the vapour of boiling water in a closed oven. They are then spread out to dry. The subsequent stages, until the cloth is removed from the loom, include nothing which interests, or at least instructs, artisans in the West.

Varieties of the Má.—The *Chú Má* is found wild, but in this state attains only three or four feet, and is seldom used except for twine. *King Má* grows nearly as high as the *Chú Má*, the fibre is separated only by rotting in water. The stalks are dipped in sulphur and employed for matches. Its flowers are yellow. Very coarse cloth and sandals are made from its fibre. The thread of this *Má* made in *Kongsi*, is said to be as fine as silk. *Tá Má* or *Hán* (dynasty) *Má*, and also called fine hemp, is likewise employed for making cloth and for ropes; its fibre is used as a support to the pith employed as candle wicks. *Luh Má* produces the hemp of which rice bags are manufactured, and also ropes. The *Tung Má* and the *Pi Má* are used for making pigments, one serving for cakes, the other for paper. The only other *Má* that need be named in this list is the *Chí Má*, *Sesamum indicum.* It was brought from India in the reign of Kingti, B. C. 156. It is now found in all parts of the empire. Its seeds are used in cakes, and like almost every kind of *Má*, it yields oil. *Flax*—It would seem from various English and Chinese Dictionaries, that flax is found in China, but of the existence of *Linum usitatissimum*, I cannot discover the slightest evidence. It seems to have been confounded with the last named plant. The above are all the facts respecting the *Má* which I have been able to glean from native authors, the deficiency can only be supplied by personal observation. The *Chú Má* of this place can be inspected and described when in flower. This imperfect account of the plants producing the fibre from which the grass-cloth of commerce is manufactured (evidently a misnomer), would be yet more defective were the *Kóh* plant to be wholly omitted. It is described as a creeper, which every year springs from an immense root, and grows from ten to thirty feet in length, clinging to trees when within reach. The root is purple on the outside, and white within, it is made into flour like arrow-root. I have found it an useful substitute for the

Maranta arundinacea. Its leaves have three points, they are long, green on the face, and bright below. In August it has blended purple flowers. The fibre is strongly adherent to the stalk, and is only loosened by boiling it in water. It is then taken off with the finger nails, exposed for a long time to running water, and beaten with mallets. It undergoes the same processes as the *Má,* but seems to require more beating and boiling: wooden utensils make it dark. The *Kóh,* like the *Má,* has been manufactured from high antiquity, and is found throughout the same extensive region in which the latter abounds. The cloth made from it is *yellow,* and as fine as ordinary grass-cloth, it cannot be bleached white, in summer it is much worn by respectable Chinese. The best brought to Ningpo, is called *Háinán Kóh* cloth, and is perhaps manufactured on the island of Háinán. If by the *Kunkhura* you mean the *Urtica tenacissima* of Roxburgh, it is probable that it is a different plant from either variety of the *Má.* As the hindrance to the manufacture of the former is owing to the difficulty attending the peeling of the fibre, would it not be well to treat it, as the Chinese do the *Kóh,* viz. by boiling? If the *Kunkhura* should prove useless, may not the catalogue of Dr. Wallich, which contains forty-seven species of *Urticeæ,* include the *Má,* the *Kóh,* or an available substitute? The observations of Dr. Roxburgh, on the various specimens of fibrous vegetables, the produce of India, may perhaps be consulted with advantage in connection with the Chinese account of the *Má.* Besides the enclosed, I shall only be able to send you some seeds of the *Chú Má.* There can be no doubt that if seeds of the proper kind be procured from China, the plant may be introduced into India if it be not indigenous to her soil. To secure success it would perhaps be well to procure them from each of the open ports of China. From Canton is exported the finest cloth manufactured in the empire. This superiority the Chinese attribute to the greater skill of the Canton workmen. Foreigners have referred that fibre to two plants, *Cannabis sativa*, and *Sida tilæfolia* (Dr. Abel).* From Shanghai is exported the fine strong fibre you have referred to, the *Urtica nivea*. It was through the efforts of the H. E. I. Company of Canton, that seeds were procured and forwarded to England. By referring to the 47th page of the 72nd Vol. of the Philosophical Transactions, there will be found a paper on Chinese Hemp by Mr. Furgusson, and a notice of the experiments tried with the seeds in England, (vid. Encyc. Brittannica). Had they possessed the hints here extracted from Chinese writers on this plant, the experiments of the gentlemen named in the above paper would probably have been more successful. Should the Society wish to pursue the subject further, some useful information may be obtained from a series of sketches, 120 in number, illustrating the culture and manufacture of grass-cloth, by Tinqua, 12, New China St., Canton, a translation of the text accompanying the drawings may be found in the Chinese Repository for May 1847. It was the special province of Monsieur Hedde, of the late embassy from France to China, to collect facts and specimens illustrative of the agriculture and manufactures of China. The result of his observations have, I believe, been published in Paris, containing a notice of one variety of the *Má*. Osbeck, a pupil and countryman of Linnæus, and Dr. Abel, Naturalist of Lord Amherst's embassy, have noticed the *Má*. The Agricultural Society of Bengal, aiming to develope the industrial resources of a great empire, and thereby to improve its inhabitants, has a claim upon the services of all who can contribute in any manner to its objects. Allow me to assure the Society, that I shall take great pleasure in responding to any further calls you may have occasion to make.

Ningpo : June 1st, 1848.

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* It has also been referred to *Corchorus capsularis*. Vide Bennett's Wanderings in N. S. Wales and China.—Eds.

NOTE BY DR. FALCONER.—As there are no specimens accompanying Dr. Macgowan's paper on the grass-cloth of China, it is impossible to decide as to the accuracy of his statement that the fibre is produced by a species of *Cannabis*, which he provisionally calls *Cannabis sinensis*. This point cannot be determined without an examination of the flowers ;* and Dr. Macgowan does not appear to have seen them. But the description given by him is entirely that of the species of *Bœhmeria* (formerly *Urtica*), called *B. nivea* or *tenacissima* by Botanists, or of a nearly allied species; and I am not aware of any evidence to support the idea that the China grass-cloth *(Chú Má)* is derived from a species of *Cannabis*. One of the other kinds mentioned by Dr. Macgowan, *King Má*, was forwarded to Dr. Roxburgh, from Canton, by Mr. Kerr, in 1812.

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* A second reference has been made to Dr. Macgowan on this point, and specimens will no doubt be shortly received.—EDS.

Report on the Oil of the seed of the Mahwa tree (Bassia latifolia). Communicated by the Society of Arts.

Adelphi: 13th September, 1848.

J. HUME, ESQ., *Honorary Secretary of the Agricultural Society, Calcutta.*

SIR,—I am directed by our Committee of Chemistry, Trade, and Manufactures, to forward to you the following report relative to the oil of the *Bassia latifolia.**

The receipt of your parcels of oil having been reported to the Council, the same were referred to a joint Committee for consideration, and the following are the results of the experiments which have been made. An analysis of the oil having been made by W. Hawes, Esq., the following is his report:

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* This oil was originally received from Mr. C. B. Taylor, of Palamow, in which district the tree abounds; but it is also common throughout Central and Northern India.—EDS.

"Its specific gravity is .926, in appearance it consists of a number of round crystaline grains of solid matter (stearine), embedded in an oily fluid (elain). It saponifies easily with the production of glycerine and the usual grease acids, but I could not detect lactic acid in the product; the resulting soap is good as to quality and color, and satisfactory as to quantity.

"The coloring matter in the oil passes off in the spent ley to which it communicates a brown color, similar to that produced by other vegetable oils.

"The grease acids produced after the saponification of this oil are easily separated by pressure, and afford at 40 per cent. of stearic acid, and which is inodorous while translucent, and appears admirably adapted for candles.

"If the oil can be obtained in bulk in the same state as the sample, the solid and fluid parts may be more easily separated than in most oils, and by the simple process of draining, which consists in melting the oil and allowing it to cool in a room, in tubs, heated to that degree which will allow the stearine to crystalize, leaving the elain fluid.

"When the crystalization is perfect, a plug in the bottom of the cask is removed, and the elain drawn from the solid mass, and two beautiful products are obtained.

"The elain obtained in this process from tallow is fitting for soap-making and other rough purposes. From palm oil it is too much colored to be applicable to many uses, but that obtained from this oil is superior to either, and in its appearance and properties resembles olive oil, and I think for many purposes would be as useful, especially for dyeing.

"From the examination of the oil, which I have been able to make, I have no doubt that if it can be produced at the cost of palm oil, any quantity can be used advantageously."

Although Mr. Hawes went fully into the matter, I regret that the Society did not receive any specimens of the manufactured article.

Mr. G. F. Wilson, Managing Director of the Patent Candle Company, also furnished the Society with a report, in which he states, "that the worth of the *Mahwa* oil in this country, for the manufacture of candles, is £ 8 per ton, less than Petersburgh tallow, and after making a great number of experiments upon it, he finds it to be of the same value as cocoanut oil, as its being harder makes up for the color being inferior. Large quantities could be used in this country at about £ 35 per ton." I send some of the candles and oil as returned to the Society by Mr. Wilson, but he fears, that they will not remain in a solid state through the voyage to India :* there are however processes by which candles could be made from this oil sufficiently hard for the Indian market. Samples Nos. 1 and 2 in the parcel sent are those by Mr. Wilson.

The oil having been further examined by Mr. John Thomas Cooper and other eminent Chemists, they reported that the sample of oil appears to be similar to the African Sheea butter, except that it is somewhat harder, and it would doubtless be an important introduction into this country if its price would admit of its competing with palm oil.

In addition to the above reports I am directed to inform you, that the Society caused several other experiments to be made with the oil by manufacturers of soap, and sample No. 3, is a specimen made by Mr. R. Hendrie, with a minimum amount of alkali; and No. 4, a specimen by Mr. Bortram, of soap manufactured by a new process, this specimen is much harder and more compact than the preceding.†

The whole of the parties to whom it has been submitted agree, that it is likely to be of great importance for most commercial purposes if it can be obtained in bulk at a price not exceeding that of palm oil.

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* The candles reached in a half liquified state.—Eds.

† These specimens are in the Society's museum, and open to the inspection of the public.—Eds.

In conclusion, I am directed to express to you the thanks of the Society for having forwarded to them for their examination, an article likely to be of so great importance both to the country producing and consuming it; and to assure you, that they will, at all times, be most happy to co-operate with you in obtaining reports and assisting in carrying out the objects of your Society.

SAMUEL THOS. DAVENPORT, *Asst. Secy.*

P. S.—The above report would have been forwarded some time since, but was delayed in hopes that further specimens would have been forwarded to the Society to be remitted to you.

Report of the Committee upon the Cotton-cleansing Machines; with a memorandum descriptive of the Machine to which the Society's gold medal and premium of Rs. 500 *were awarded.*

Your Committee assembled at the Society's rooms, Metcalfe Hall, on the afternoon of Saturday, the 23rd September, and proceeded to settle the mode in which the experiments should be tried for determining the comparative merits of the three cotton-cleaning machines, entered for competition for the gold medal of your Society, and the premium offered by Major Jenkins.

2nd. It was settled, that the native *churka* should be tried in the first instance as a standard of comparison for the competing machines. Also, that the experiments were to consist in passing one-quarter of a pound of *kupas* through each machine, the time which lapsed during this operation to be noted, and the seeds and cotton to be then separately weighed, and lastly, the cotton passed through to be examined as to its cleanliness, quality of staple, and whether it was

opened out or clotted. The *kupas* under experiment was from the Agra district, forwarded by the Lieutenant Governor of the North-Western Provinces.

3rd. A native was to pass the cotton through the *churka,* Mr. John Fraser, Civil Engineer, (who undertook at the request of the Society to see that Mr. Burn's machine was in the best possible working order) was to pass the cotton through the machines of Mr. Potter and Mr. Burn, and Mr. Mather was to pass it through his own machine. These preliminaries being settled, the experiments were proceeded with; in the course of our proceedings it was observed, that the scales with which the cotton was weighed were unsuitable for so nice an operation, and upon the fourth experiment being tried, they gave so absurd a result, that a repetition of that experiment was determined on to ascertain if any error had been committed in the weighing. The result of the repetition showed the fault to be in the scales which were not sensitive enough for our purpose, whereupon it was resolved to re-weigh with proper scales the cotton and seeds of each experiment, they being carefully kept apart for that purpose, as well as for examination. The following Table shows the experiments as they stood at the close of the trial:

TABLE I.

No. of Experiments	Name of Machine.	Weight of Kupas used as per common scales	Time elapsed in the experiment.		Weight after experiment as per common scales.			
					Of Seeds.		of Cotton.	
			M.	S.	Rs.	As.	Rs.	As.
1	Native Churka, ..	$\frac{1}{4}$ lb.	8	50	6	0	4	0
2	Potter's, ...	Ditto,	7	50	6	0	4	0
3	Burn's, ...	Ditto,	6	0	6	0	4	0
4	Mather's, ...	Ditto,	3	30	6	0	5	0
5	Ditto repeated, ..	Ditto,	2	58	5	14	4	6

4th. On the 25th instant the re-weighing took place with proper scales, the weights were again taken in Rupees and Annas, and the following Table shows the results :

TABLE II.

No. of Experiments.	Name of Machine.	Weight of				Total weight.	
		Cotton.		Seeds.			
		Rs.	As.	Rs.	As.	Rs.	As.
1	Native Churka, ...	4	1	6	$3\frac{3}{5}$	10	$4\frac{3}{5}$
2	Potter's, ...	3	$10\frac{2}{5}$	6	$3\frac{1}{5}$	9	$13\frac{3}{5}$
3	Burn's, ...	4	$0\frac{3}{5}$	5	$14\frac{4}{5}$	9	$15\frac{2}{5}$
4	Mather's, ...	4	$13\frac{3}{5}$	6	3	11	$0\frac{3}{5}$
5	Ditto repeated, ...	3	$10\frac{4}{5}$	6	0	9	$10\frac{4}{5}$

As there was no dirt worth naming in the *kupas* that was experimented upon, except a very few bits of leaves of the plant, which were all weighed either with the cotton or with the seeds, there could have been no loss in the operation sufficient to effect our results, therefore the last column of the above Table shows the weight of *kupas* originally applied to each machine, instead of an even quarter of a pound as given by the imperfect scales; consequently, it appears that in the 4th experiment the largest quantity of *kupas* was used ; in the 1st experiment the next largest quantity ; and in the 3rd experiment the next largest quantity ; and lastly, in the 2nd experiment the smallest quantity of *kupas* was used; the repetition of the trial with Mather's machine being left out of consideration.

5th. Now, by applying the times noted, as given in Table I. to the true weights, as shown in Table II. and rejecting the repetition of the experiment with Mather's machine, we obtain a correct Table of our experiments as follows :

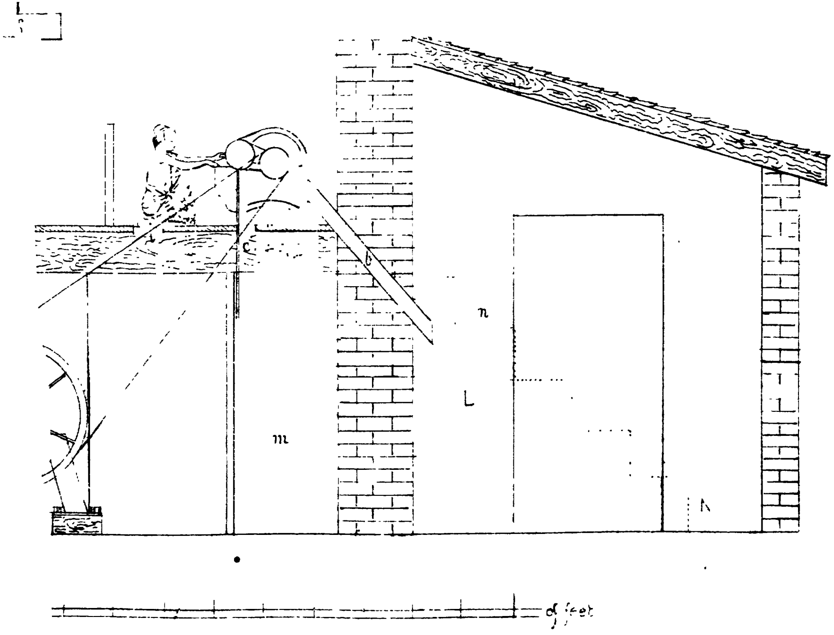
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TABLE III.

No. of Experiments.	Name of Machine.	Time elapsed.		Weight of Kupas used.		Weight of results.			
						Cotton.		Seed.	
		M.	S.	Rs.	As.	Rs.	As.	Rs.	As.
1	Native Churka, ..	8	50	10	4$\frac{3}{5}$	4	1	6	3$\frac{3}{5}$
2	Potter's, ...	7	50	9	13$\frac{3}{5}$	3	10$\frac{2}{5}$	6	3$\frac{1}{5}$
	Burn's, ...	6	0	9	15$\frac{2}{5}$	4	0$\frac{3}{5}$	5	14$\frac{4}{5}$
	Mather's, ...	3	30	11	0$\frac{3}{5}$	4	13$\frac{3}{5}$	6	3

6th. By reducing the weight of *kupas* used in each experiment from Rupees and Annas (in which it was taken for convenience at the time,) to its corresponding weight in decimals of pounds; and by proportionately dertermining what weight of *kupas* each machine would clean in a day of 12 hours, we get the following Table IV. We have assumed 12 hours as the extent of a day's work in our comparison, but for this purpose it matters not how long a time be taken, always provided that the same period be applied to each of the machines to obtain a correct comparative result; comparative and not absolute results being all that is required or can be obtained in the present enquiry. In actual practice it will often happen, that a man having a large family may, with their aid, work his *churka* for a much longer time than a man with a small family, or than one with no family at all, but such considerations are foreign to this investigation.

TABLE IV.

No. of Experiments.	Name of Machine.	Time elapsed.		Weight of Kupas in decimals of lbs.	Weight of Kupas that would be cleaned in 12 hours.		Weight of clean cotton produced in decimals of lbs.	Weight of clean cotton produced in 12 hours.	
		M.	S.	lbs.	lbs.	oz.	lbs.	lbs.	oz.
1	Native Churka, ..	8	50	0.257	20	15	0.1016	8	4.50
2	Potter's, ...	7	50	0.246	22	10	0.0912	8	6.12
3	Burn's, ...	6	0	0.249	29	14	0.1009	12	1.72
4	Mather's, ..	3	30	0.276	56	12	0.1212	24	14.77

The above Table shows the out-turn of the several machines, and calling that of the native *churka* 1, or unity, the comparative merits as regards out-turn will be as follows:

Native *churka*,	1
Potter's,	1.012
Burn's,	1.462
Mather's,	3.010

By this it appears, that the merits of the machines, so far as out-turn is concerned, is inversely in the order in which the experiments were made. But, with the exception of the native *churka*, it is not to be understood that your Committee consider the above figures to represent the correct out-turn of the machines when working upon a large scale, for the experiments were far too small to determine that point, but were sufficient to fix their relative merits, which your Committee consider was more particularly their business.

7th. There is another point to be considered, namely, that the native *churka* was worked by *one* man only, whereas the other machines were worked by two men turning a fly-wheel, whilst a *third* man fed the machine, making three men; the out-turn therefore ought to be three times as great as that by the native *churka*, to make the results equable in regard to cost for labor. This we find to be the case in Mather's machine only, and assuming the price of labor per man to be the same for each machine, the relative merits of the two machines as regards cost of working, as shown by these experiments, are very nearly identical, and may be thus expressed:

	Cost of working.	*Out-turn.*
Native *churka*,	1	1
Mather's machine,	3	3.01

It should here be stated, that the cost of Mather's machine is 60 Rupees, that of the native *churka* probably 1 Rupee.

8th. Thus, so far as cost of working and out-turn is concerned, the result by these experiments is the same for the native *churka* and Mather's machine. It remains now to compare the quality of the cotton after being experimented upon, as respects cleanliness, opening out of staple, &c. The cotton cleaned in the foregoing experiments was submitted to the examination of the two persons named by the Society, and whom your Committee considered as very competent judges, namely, Mr. Edward Smith, a cotton manufacturer from Manchester, and Mr. Marshall, the manager of Fort Glo'ster cotton mills. The packages containing the samples for their inspection were numbered 1, 2, 3, &c., without stating the machine the numbers referred to. The opinions of these gentlemen are given in the Appendix Nos. 1 and 2, and need not be quoted in full here: it being sufficient to state, that they both decidedly gave the preference to the packages marked 4 and 5, which were from Mather's machine. The order of merit they both assigned to the samples was as follows—

1. Mather's machine.
2. Native *churka.*
3. Potter's machine.
4. Burn's machine.

In the opinion of these gentlemen your Committee fully concur. Mr. Smith further states, "that were the Surat cottons, which enter the Liverpool market, cleaned equally as well as the samples 4 and 5 (from Mather's machine), they would bring from ¼ to ⅜ of a penny per ℔. more than they now do," which would (taking the average of those sums, namely, 212 of a penny) be an increase in price equal to two shillings and three half pence per maund. And Mr. Marshall's statement nearly agrees therewith, for he says, "its value would be enhanced more than a Rupee a maund, or say on an average 10 per cent." The *kupas* upon which the experiments were tried was, as stated in para. 2, from the Agra district, and was remarkably clean picked, being almost wholly free from bits of leaves, whilst that which is sent from Surat or from the Nurbudda districts, your Committee believe to have much less care bestowed on it in this respect, and is generally very dirty; and although it is to be regretted, that none of this foul *kupas* could be procured at the time for the experiment, yet your Committee see no reason to suppose that the like *comparative* superiority would not have been displayed by the Mather's machine on the dirty muster as upon that submitted to the trial.

9th. Before coming to a final conclusion upon the merits of the machines, your Committee again tried the experiments between the native *churka* and Mather's machine, using half a pound of cotton to each, both Mr. Potter's and Mr. Burn's machines being now considered as so decidedly surpassed by Mather's, and not performing the work so satisfactorily as the native *churka*, were omitted from further consideration. The following Table gives the particulars of the last trial:

TABLE V.

Name of Machine.	Time elapsed.	Weight of Kupas in decimals of lbs.	Weight of result in decimals of lbs.		Weight of Kupas that would be cleaned in 12 hours.	Weight of clean cotton produced in 12 hours.
			Cotton.	Seed.		
	M. S.	lbs.	lbs.	lbs.	lbs. oz.	lbs. oz.
Native Churka, ..	17 24	0.500	0.192	0.308	20 11	7 15.11
Mather's, ...	6 20	0.500	0.190	0.310	56 13	21 9.60

Now, treating this experiment in the same way as was done with the former, in paras. 6 and 7, we get the following comparison:

	Cost of working.	*Out-turn.*
Native *churka*, ...	1	1
Mather's machine, ...	3	2.719

This result differs from that of the former experiment, and there can be no doubt that, if they were repeated again and again, a different result would be obtained with each repetition, as such is invariably the case with correct experiments of every kind: the usual course in such cases is to take the mean; if we follow this plan, the mean result of our two experiments between the native *churka* and Mather's machine would be as follows:

	Cost of working.	*Out-turn.*
Native *churka*, ...	1	1
Mather's machine, ...	3	2.864

This result would show the out-turn by Mather's machine is less in proportion to its cost of working than that by the native *churka*. But it must be stated, that we have been considering the machine as worked by three men when comparing it with the native *churka*, although this is not the mode intended to work the 12 machines now made for Government (which will be all worked together by animal power), and your Committee consider that no satisfactory result as to the actual working of Mather's machine can be arrived at until tried upon the large scale intended by Government.

10th. If from the foregoing statement and discussion of facts the Society should proceed to deliberate upon the propriety of awarding Mr. Mather their prize, your Committee think it proper to state, it has been suggested that the original cost of Mr. Mather's machine, namely, 60 Rupees, being so much greater than that of the native *churka*, namely, about one Rupee, would, in a measure, be a prohibition to the poor people of this country availing themselves of it. This objection however seems to be over-ruled, as far as regards the prize, by the Society's own proceedings on the 11th October 1847 (vide Journal of the Society, Part 2, Vol. vi.,) and 12th February 1848, (vide Journal of the Society, Part 3, Vol. vi.) wherein the Society agreed to admit both Mr. Burn's and Mr. Mather's machines with a knowledge that the cost of the former was £3 to £4 each, and that of the latter 60 Rupees. This therefore would appear to set the matter of the cost of the machine out of the question as respects the Society's gold medal, but it is not for this Committee to offer any decision upon this point. And with respect to the premium offered by Major Jenkins, we find in Part 1, Vol. vi. of the Society's Journal, that at a meeting of the Society, held on 12th May 1847, and also at their next meeting on the 9th June 1847, a correspondence was read from Dr. Wight, Mr. Petrie and Major Jenkins, relative to Mr. Petrie's saw-gin and Mr. Burn's machine, from which it would appear, that Burn's machine came within Major Jenkins' intentions, and if so, Mr. Mather's we presume would also. Nevertheless, your Committee, at the same time that they would recommend Mr. Mather's machine to the favorable consideration of the Society for their medal, consider it is due to Major Jenkins to refer the whole of the case to him for his decision respecting his own munificent premium.

11th, Your Committee think it necessary to state, that they do not consider that Mather's machine, in its present state, is perfect, having no doubt but that gentleman will improve many of its details during the construction of the large additional number he is about to make for the Government for distribution through the principal cotton growing districts of India. Your Committee, at the same time, would guard the Society from the supposition, that this machine, however great an improvement, is likely in the present state of civilization and agricultural progress in India to become an available machine to the cotton growing population: the machine however as it now stands, appears to your Committee to be highly creditable to Mr. Mather's ingenuity and perseverance in its construction, in its workmanship, and in its results; and it is also worthy of notice, that it has been entirely made in India. Should the Society concur in the recommendation of your Committee and award Mr. Mather the prize, they would suggest, that he be requested to furnish drawings of the machine, accompanied with a paper explanatory of its mechanical details, and also of the manner in which it is intended by Government to fit up and work twelve of them together by animal power, and any other particulars that he might deem of importance. Your Committee are of opinion, that the publication of such particulars in the Society's Journal would enable others to manufacture the like machines in remote localities, and lead to its being early brought to the utmost perfection it is capable of.*

12th. It may be worth remarking, that all the machines submitted for trial follow the principle of the native *churka*, namely, having two rollers through which the cotton is passed and stripped from the seeds, which are rejected and remain (or ought to remain) behind, whilst the cotton is drawn through; so far they resemble each other and the native *churka;* but they differ very materially in the diameters of the rollers, which doubtless has much to do with the success of the machine. The following table shows the diameter of the rollers of each of them:

Table showing the comparative sizes of the rollers of the Native Churka and of the three new Cotton-cleaning Machines.

No.	Names.	Diameter of upper roller at its ends.	Upper roller at centre.	Mean diameter of upper roller.	Diameter of lower roller.	Relat pro- portio the 2 roll
		Inch.				
	Native Churka, ..	$\frac{9}{16}$ & $\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{4}$ $1\frac{3}{16}$	As 1 to 2
	Potter's machine, ..	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{5}{8}$	$2\frac{1}{2}$	1 to 4
	Burn's machine, ...	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$2\frac{3}{8}$	1 to $3\frac{1}{6}$
	Mather's machine, ..	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	1 to 3

Two of the machines, namely, Burn's and Mather's, have the brush-fan applied to them, this application was in all probability copied from the American saw-gin, which is similarly furnished, but this ought no more to be considered as detracting from the merit of either Mr. Burn or Mr. Mather than the application of the crank (which had been in use from time immemorial in the turning lathe and spinning wheel) detracted from the merit of the person who applied it to convert the reciprocating motion of a steam-engine into a rotatory one, for which a patent was granted by the Crown, and which patent was not litigated even by the celebrated Mr. Watt, to whom the application of the crank as above-named would have been of great value.

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* It will be perceived, that this recommendation of the Committee, has been attended to.—Eds.

13th. Before concluding their Report your Committee deem it incumbent on them to express their thanks to Mr. John Fraser, Civil Engineer, for his kind and constant attention to the Society's and their wishes, in seeing that Mr. Burn's machine was in the best possible working order at the time of the experiment, and also in working it during the trial, Mr. Burn having appointed no one to look to his interest during the proceedings; Mr. Fraser likewise most willingly undertook a similar office for Mr. Potter's machine. He being altogether a disinterested party, places, in the opinion of your Committee, the fairness of their experiments beyond the possibility of suspicion. To Mr. Mather also the thanks of the Committee are due for the trouble he took in arranging and fitting up the room for the trial, which he did with the advice and assistance of your able Assistant Secretary, Mr. Blechynden, whose attention and assistance to the Committee throughout their proceedings was of the greatest service.

CALCUTTA:
30th October, 1848.

F. W. SIMMS, *Civil Engineer.*
WM. SAGE, *Lieut.-Colonel.*
J. M. VOS, *Civil Architect & Engineer.*
CHARLES HUFFNAGLE.
WILLIS EARLE.
JOSEPH WILLIS.

I find embodied in a Resolution of the Society, published in Part 1, Vol. vi., page xxiv., "that the object of restricting the gold medal and prize of 500 Rs., to an improvement on the Indian Churka, is to *ensure* a machine which should not only effect its work *quickly* and efficaciously, but be of a sufficiently moderate cost to admit of its being employed alike by the poorer as by the richer classes interested in cotton-cleaning." In proportion to the number of hands employed to work it, the improved machine under consideration appears to work rather more *slowly* than the native *churka*, and with reference to cost the comparison is more than twenty to one in favor of the Native instrument, i. e. more than twenty times the capital has to be invested in the new apparatus, to give an equal out-turn in the same time with native *churkas*. One of the greatest objections to the native machine is the extreme slowness of its action, as when properly constructed it separates the seed from the wool very fairly. It does not appear to me that the new machine fulfils the requisition of speed.

The present annual export of cotton from Calcutta is stated to be about 1,200,000 maunds. Supposing the whole of this to be cleaned by the new machines, and they worked continuously every day, 12 hours per day, each machine yielding daily 24 lbs. of wool, 45,555 of them would be required to clean the above-mentioned quantity in three months, which at sixty Rupees each, would cost 27,33,300 Company's Rupees. The particular kind of *kupas* however experimented on by us, yields as much as 40 per cent. of cotton-wool, whilst most of the Indian cottons yield a much smaller proportion than this, some as little as 23 per cent., with which no doubt the daily out-turn would be considerably less, whilst with such machines, involving complexity and the necessity of mechanical accuracy and adjustments, a certain number would always be under repair and "*hors de combat.*" Thus the actual number required to be established would be far greater than above stated. The exports in this staple from Bombay and other ports I believe far exceed those of Calcutta, so that it would appear, that it would require enormous capital to be invested in these machines to take the place of the ordinary method—the combined effect of its comparatively high cost and slow action. Had the machine approached the saw-gin in the amount of its results, the cost would have been moderate, but as it is, such does not appear to be the case.

It has occurred to me to offer these observations as it appears so desirable, that the Society should be put in possession of all the data available, in order to come to a correct conclusion on a subject affecting so important and national a staple as the one in question.

HY. MORNAY,
Member of the Committee.

The 10th and 11th paras. of the report, render the above remarks in my opinion, null. The 10th shows the Society's proceedings regarding the prizes to be awarded, and the 11th states, "your Committee at the same time would guard the Society from the supposition that this machine, however great the improvement, is likely in the present state of civilization, and agricultural progress in India, to become an available machine to the cotton growing population." Now, what is the improvement here spoken of? Why it would turn out cotton, worth one rupee per maund, more in the market than what is now sold as the produce of the Surat country, and cleaned of course by the *churka?* See para. 8, of the report. It appears to me that the superiority is established.

November 15th, 1848. WM. SAGE.

APPENDIX No. I.

Report upon five samples of Cotton passed through certain Churkas on the 23rd September, 1848.

No. 1.—Moderately clean, and *almost freed from seed*, as well as the seed from the cotton.

No. 2.—This sample is not sufficiently clean, and by having so much seed in it in a crushed state, will be objectionable. The seed also, from this batch of cotton, does not appear to be stripped or freed from portions of cotton which still adhere to it, and the cotton is not sufficiently opened out, but clotted together.

No. 3.—Is very full of black moats, exceedingly dirty, and the seed from this parcel is not sufficiently stripped of the cotton. This is a worse sample than No. 2, and would, for general purposes, have to be re-picked before it could be used.

No. 4.—I regard this as a very clean parcel, and might be used with a mixture of American for the manufacturing of cloths which have the greatest bulk of consumption. The seed also seems well freed, and it would bring a much higher price than No. 3 in the Liverpool market.

No. 5.—This is also a good sample, and could, with No. 4, be generally used in mixing with American. It is, in my opinion, cleaner than most American we receive in Liverpool. The seed is well freed also. There would be very little difference in value between these two, Nos. 4 and 5.

I consider, that were the Surat cottons which enter the Liverpool market, cleaned equally as well as samples No. 4 and 5, they would bring ¼*d.* to ⅜*d.* per ℔. more than they now do. It would, moreover, be a great advantage, as well as a saving to spinners, to receive them in so clean a state.

(Signed) EDWARD SMITH.

CALCUTTA:
25th September, 1848.

APPENDIX No. 2.

Calcutta: 27th September, 1848.

Dear Sir,—I have the pleasure to acknowledge the receipt of your letter of 20th instant, and underneath I beg to hand you replies to the questions contained therein.

1st. As to the cleanliness of the samples. The following is the order in which I should place the several packages you have sent me, Nos. 4 and 5—1, 2, 3; one of the advantages which the packages Nos. 4 and 5 have over the other lots is the total absence of crushed or broken seeds.

2nd. As to the state in which they have been opened out and their fitness for the carding and spinning machines. In this case also, I should place the samples as I have done above. The benefit arising from the cotton being opened in passing through the *churka*, specially cotton of very short staple such as this, would not, I think, be of much importance, were it not that by this means the cotton would be more thoroughly cleaned of leaf than it can be, (without considerable injury to the staple) after it has once been pressed in the bale; it is unfortunate therefore that the *kupas* tried at the late meeting of the Society was so clear of leaf, as not to show how far the brushes were adapted for this purpose. With respect to the carding and spinning, it must be always a great advantage to have the cotton clean not only from the injury which the broken seeds and leaf do to the card-sheeting, but also from the irregularities that they cause in the thread. I have more difficulty in answering your 3rd question relative to the comparative value of your samples and the cotton used at the Glo'ster mills, inasmuch as it appears to me they are not at all adapted for the same market,—thus in Liverpool, there is no doubt that the Surat or Omrawuttee cotton, which is the cotton used at the Glo'ster mills, would bring a higher price than yours, whereas the result would probably be very different if both samples were sent to China. I have no hesitation however in saying, that could the Glo'ster Mills Company procure Surat cotton equal in cleanliness to your samples No. 4 and 5, its value would be enhanced more than a Rupee a maund, or say on an average 10 per cent. The cotton which the Glo'ster Company principally use is Surat or Omrawuttee cotton, and is chiefly grown, I believe, at Surat and in the Nizam's territories; it is imported from Bombay for the mill; for though a large quantity comes Overland viâ Mirzapore, yet it has been found not only higher in price, but considerably more dirty and of worse quality than that procured from Bombay.

I am, dear Sir,
Your's faithfully,
(Signed) H. Marshall.

The Secretary Agri-Horticultural Society,
Metcalfe Hall.

Memorandum descriptive of the New Cotton-cleaning Machines, constructed for Government by J. H. Mather, *Civil Engineer.*

The new cotton-cleaning machine, for which the Agricultural and Horticultural Society of India awarded their gold medal and the premium of five hundred rupees, placed at their disposal by Major Jenkins, and of which four views are given in Plate I, was one out of a set of twelve which were constructed for the Government of the north-western provinces, and have lately been despatched to Agra, where it is intended to erect them in a building, of which a plan and section are given in Plate II. The motive power will be supplied to the machines when thus erected from a cattle-mill worked by a pair of bullocks, which will be connected by means of a band or strap with the pulley (marked *g* in Plate II,) keyed on to the end of the main shaft *e*; the machines will be placed in the upper room of the cleaning-house and will be driven by the straps marked H, off the pulleys *d*, which are also keyed on to the main shaft, and are of three feet diameter each. The *kupas*, when first brought to the cleaning-house, will be placed in the long bin J, in the upper room, whence it will be supplied as required, to the boxes K, of the several machines. The operation of feeding the machine is shown in Fig. IV. Plate I, as well as in the sectional view of the cleaning-house in Plate II, the cleaned cotton is discharged from the machine through a spout *b*, which forms part of the machine, and passes through the wall of the building into the two enclosed verandah-rooms L: these latter rooms will be closed while the machines are at work, and will only be opened at the end of the day's work for the removal of the cotton. This arrangement alone will be found to protect the cotton very considerably from the impurities which at present find their way into it after it has been cleaned by the native *churka.* The seed when separated from the cotton will fall down the spout F, (Fig. III. Plate I,) into the space partitioned off to receive it on the ground-floor marked *m,* Plate II.

Fig. III. Plate I, exhibits a sectional view of the machine. A and B are the two rollers between which the cotton is passed, and at the point of contact between which it is divested of its seed. The lower roller A, is made of hard wood, of one-half inch diameter; a wrought iron spindle or shaft, three-quarters inch in diameter, is inserted through this roller from end to end, on to which is keyed the spur-wheel M, which is driven from the driving shaft of the machine by the pinion N. The upper roller B, is of steel, half inch in diameter, and its surface is slightly indented with chisel-cuts in a diagonal direction, in order to give it some hold on the cotton; on to one end of the steel roller the pulley P, Fig. II. is keyed, which is driven by a strap from pulley S, Fig. IV. on the driving shaft of the machine; the two rollers are driven at the same surface velocity, viz. the wooden roller (one and a half inch in diameter) makes *one* revolution, while the steel roller (half inch in diameter) makes *three.*

The brushes C, Fig. III. attached to the four cast-iron arms on the driving shafts revolve rapidly, and sweep the wooden roller at three-quarters of an inch below the point of contact of the two rollers, such being found to be the average length of the fibre of the cotton for which these machines were intended. The length of the brushes can however be varied by means of their adjusting screws to suit any description of cotton.

Below the brushes is a concave-shaped iron wire grating D, through which dirt, dust, and particles of leaf adhering to the *kupas* are discharged by the action of the brushes. The cleaned cotton is then thrown by the brushes through the spout marked E, Figs. III. & IV. in Plate I, and *b,* in plate II, into the verandah-rooms L. The winch-handle and fly-wheel, Fig. IV. Plate I, represent the manner in which the machine was worked when exhibited to the Society in the Metcalfe Hall; this manner of working the machine was adopted on that occasion simply on account of there being no cattle-mill available for the purpose. The Special Committee of the Society notice in their report, that two men were employed to work this machine in addition to the man who fed it, and this has given rise to the erroneous impression that three men are *required* for each machine; whereas with suitable driving apparatus *one man* could drive at least 3 machines. The fly-wheel, &c. used in the Metcalfe Hall was an old one belonging to the Agricultural and Horticultural Society, and was quite unsuited for the purpose. Owing to these circumstances the only point on which a correct opinion could be formed by those who were present at the exhibition was, on the *quality of the cotton* turned out by this machine in comparison to that turned out by the native *churka*, and the other two competing machines. On this point the most satisfactory evidence was afforded to the Committee (see their report para. 8) as to the superiority of the cotton turned out by *this* machine. The Committee moreover in the 9th para. of their report state, with regard to the motive power applied at the time of exhibition, "your Committee consider that no satisfactory result as to the actual working of *Mather's* machine can be arrived at until tried upon the large scale intended by Government."

There are a few alterations which it will be desirable to introduce into any machines hereafter to be made, among which the giving additional speed to the brush-arms may be mentioned.

The Government have sanctioned the construction of eight sets of these machines for distribution in the Presidencies of Bombay and Madras, and have directed the work to be carried on at the Government iron bridge yard.

(Signed) J. H. MATHER, *Civil Engineer,*
Suptdg. Govt. Cotton Experiments.

IRON BRIDGE YARD, ALLIPORE:
6th January, 1849.

Further notice regarding the "Pooah" of Nipal and Sikim; "Poee" of Gurhwall and Kumaoon; Bœhmeria frutescens, *Don;* Urtica frutescens, *Thunb.*

In September 1847, the Society received from Dr. Campbell, the Superintendent of Darjeeling, specimens of a new sort of fibre, called *Pooah,* obtained from a plant which "grows wild and abundantly in the valleys throughout the mountains of eastern Nipal and Sikim; at the foot of the hills skirting the Tarai, to the elevation of 1,000 or 1,200 feet, and within the mountains up to 3,000 feet." In an interesting notice accompanying this specimen, (which will be found at page 135 of this volume,) Dr. Campbell describes the plant, its *habitat,* the method of preparing the fibre, and the uses to which it is applied. The very favorable report (also published) made on this fibre by Captain Thompson, a member of the Flax and Hemp Committee, to the effect that, when properly dressed, he considered it quite equal to the best European flax, and better fitted for converting into sailcloth than any other substance he had seen in India, induced the Society to apply to Dr. Campbell for specimens of the plant, with the view of ascertaining its name, and if it was to be found in other parts of the Himalayan valleys, than those mentioned by him. These he has been kind enough to send, and for the following report on them, the Society is indebted to Dr. Falconer, Supt. H. C. Botanic Garden:—

"I have examined Dr. Campbell's specimen of the *Pooah* plant. It is the *Bœhmeria frutescens* of Botanists, common at lower elevations in the Himalayas from Gurwahl to the Sikim hills (Ganges to Burrampooter). In the outer hills of Gurwahl and Kumaoon it is called *Poee,* and the tough fibre is used there for making nets. The wood of another species is turned into bowls. In Darjeeling *B. frutescens* goes by a similar name *Pooah,* and the fibre is used for similar purposes.

"It was first described from Japan by Thunberg, who distinguishes it from the textile species *Bœhmeria* (or *Urtica*) *nivea*, which occurs there in abundance.

"I return the specimen herewith. It is a *male* flowered branch, the female plant differs."

SPECIMEN FROM DR. CAMPBELL, DARJEELING.

Bœhmeria frutescens, Don. Prod. Flor. Nepal. Syn.—Urtica frutescens, Thunb. Flor. Japan. p. 70.

Char.—Bœhmeria. "With the leaves elliptic-oblong, acuminated, "coarsely serrated, acute at the base, covered underneath with a "white coat; the branchlets with soft hair: the common flower-"stalks axillary and divaricately branched."

Hab.—Japan and Himalayas, from Gurwahl to Darjeeling.

In Darjeeling called "Pooah."

In Gurwahl and Kumaoon "Poee," fibre very tough, and made into nets.

On the treatment of the Peach. Communicated by DR. K. M. SCOTT.

[Dr. K. M. Scott, Civil Surgeon at Gowhatti, Assam, having stated in a communication to the Society, read at its general meeting in July 1848, that in the previous May he had gathered from the peach trees in his garden 60 peaches, the four largest of which weighed together 83-12, the six next largest 104-8, and very few under 12 and 14 tolahs, with a circumference of from 9 to 10¾ inches, was requested to furnish a few particulars as to his plan of treating his trees. These he has been so obliging as to submit to the Society, and they are now published for the information of those who take an interest in the raising of this fine fruit.]

I promised to let you know how my peach trees are treated, it is thus. In October I have a pit dug about 6 or 8 feet square and 4 deep, into it is first put a layer of sheep and cow-dung mixed with charcoal, about 12 inches in depth, over this a layer of small fish, (say about 10 seers,) upon which is sprinkled about a seer of lime. On the lime again, another layer of sheep and cow-dung, with charcoal and wood-ashes, going on as before till the pit is filled, when it is covered over with a layer of soil. Last year I added some *khullee* (mustard oil cake), and I think with much benefit. Old skins and bones chopped up, mixed with sheep and cow-dung, and a little lime, and buried for 6 or 8 months, make a fine addition to the other. About the end of November, or when the flower-buds begin to appear, the trees are pruned, and the roots bored, to about 2½ feet from the stem all round with a sharp-pointed bamboo, so as not to cut them. They are left exposed for about 3 weeks. After this the contents of the pit are mixed up with a little more charcoal, and spread among the roots, and the soil which was taken from them, strewed lightly over. As the peaches are formed they are thinned out, and when nearly ripe, bags are put on them to defend them from insects.

I have some cocoanut trees which I planted (from seed got from the bazar here) thriving famously, and now with beautiful heads of flowers: the two largest measure 7 feet 3 inches and 6 feet 2, respectively, in circumference: that is a good size—500 miles from the Sea!

Memoranda respecting the Government Teak plantation at Bancoorah; communicated by T. B. Mactier, Esq., C.S.: *with a few remarks thereon by Capt.* Thomas Latter, *late Supt. of the Teak Forests of the Tenasserim Provinces.*

[Attracted by an application to the Society from Capt. F. C. Burnett, of the Artillery, for a supply of teak seed for trial in the Jullundur Doab, a large extent of which country appeared to him admirably adapted for the culture, Mr. Mactier, the Magistrate of Bancoorah, proffered his services in sending a supply from the Honorable Company's plantation in that district, where the trees seed very freely. In accepting this offer a request was made to Mr. Mactier for a few particulars regarding the plantation. These he has been kind enough to afford; and they are now published under the impression that they may be new to most of the readers of the Journal. The additional remarks furnished by Capt. Latter, are valuable, from the experience which the writer has acquired on the subject generally of Teak cultivation, as is shown by the long and interesting report which will be found in another part of this number.]

I am told that the teak plantation here [Bancoorah] was commenced by Mr. William Blunt upwards of 40 years ago, the site chosen by him being the banks of the Dalkeshur river; the soil, though sandy, is good, the gardens of some of the residents of the station being situated within the line of the plantation, and the ryots cultivating sugar-cane just outside of it. The trees bore seed about 5 years after having been planted. The plantation has not been systematically cut down; trees, when fallen or undermined, have been cut, in order to save the timber, which I may observe is of good quality. Though small, the trees planted on the banks of the river have succeeded tolerably well, but those planted on the vicinity where the country is high, with a very few exceptions, have entirely failed. The trees which now exist are all hand-sown, but I am given to understand that the seed which falls from the trees in the cold weather germinates very freely in the rains, none of it however comes to anything from want of care. Of the extent of the plantation I cannot give even an approximation, it is so much scattered, but I should say upwards of 2000 trees still remain, they were at one time very much more numerous, the encroachments of the river have however carried numbers of them away I am at present trying to save those which remain by cutting down those on the brink of the bank, for when a tree falls the roots carry with them a large quantity of the earth, and a large gap is left by which the river makes further encroachment. The general opinion here is, that the trees have failed for want of moisture; it may, however, be the soil, which partakes much more of a sandy than clayey nature. Of the size of the trees I cannot give you a correct estimate, but I am told, that one which was considered a large one, measured 12 feet from the ground to the fork, its diameter just above the ground being 18 inches, and just below the fork 12 inches (rough measurement), which I calculate would give a log of about 15 cubic feet.

I may mention, that I am indebted to the kindness of Dr. Cheek, who some years ago had charge of the plantations, for most of these particulars.

I regret I am unable to furnish you with a more particular description of the soil in which these trees grow; when I say, however, that to an inexperienced eye it is that which prevails along the high banks of the Dalkeshur and Damoodah, you may perhaps be able to find some one better informed.

Note by Capt. Latter.—I was not aware till I perused Mr. Mactier's letter that there had been any teak planted in Bancoorah. The first thing that strikes me is the statement that the soil of the teak plantation is sandy, this would account for the very small size of the trees, as teak thrives best in a stiff clay. It requires plenty of moisture; but a moisture that does not settle and stagnate; this will be evident when we take into consideration the localities in which teak is most notorious, for instance, the Malabar hills, where large quantities of rain fall annually. The forests of the Tenasserim, where the average annual fall of rain is 180 inches and upwards. The Yooma hills between Arracan and Burmah, where the average has been known to range as high as 240 inches annually. But in all these localities the drainage is rapid. There are some localities in the central portions of the Thoungyeen forests, called the Mieplai district, where teak is found in somewhat low and damp spots. But in such cases the wood is spongy and of an inferior quality; the trees are almost invariably blown down before they become of any size, although the plant for the first few years appears to vegetate very luxuriantly.

The whole of the Arracan or Yooma hills, as far as they have been penetrated by Europeans, consist of immense deposits of clay, but where teak first presents itself, viz. on the banks of a mountain stream called the Hoosalong, the underlying limestone begins to present itself. It is in such localities that teak is always found, if not of the largest size, at all events of the best quality. The next best locality is the steep clayey banks of rivers. Most of the forests in the Tenasserim Provinces are so situated. It is generally known that Maulmein or Tenasserim teak is much inferior in strength and compactness to Malabar teak. But this I think will appear to have arisen simply from the fact, that the Malabar specimens were from hill teak, whereas the Maulmein teak is still confined to more easy localities on the banks of streams.

I perceive in Mr. Mactier's letter that it is stated, that he understands that the seeds which fall from the trees of the teak plantation at Bancoorah, vegetate freely of themselves during the rains, but that they never come to anything. I did not visit the Maulmein forests during the rains, but I made a very extensive inspection of them immediately after the rains, and before the commencement of the periodical fires; and I always found that where there was a young and vigorous company of teak trees there were no self-sown seedlings. But where there were a few old trees scattered about they were accompanied with swarms of seedlings. From this I inferred in my official report, that the seed of vigorously growing teak trees did not germinate, by this I meant when left to themselves. I sent a large quantity of the seeds of such trees to the Superintendent of the Botanical Gardens and to the Agricultural Society,* of which, with common care, a very fair average have come up, whereas if they had been left to run their chance in the forests, not one perhaps would have come up.

The subject of the artificial propagation of teak is too important a one to be entered upon in a short note. but I do not think it will ever succeed unless undertaken on an extensive scale, and under the careful personal superintendence of an European, practically and locally acquainted with the teak tree and its favorite localities. If left to native subordinates no reliance can be placed upon the attempt being fairly and thoroughly carried out. The first planting might be in nurseries, each seed sown 18 inches apart, but *above all, the ground should be strewed thickly with straw*, for the purpose of retaining the moisture, and preserving the dampness natural to forest soils. Each plant might then be transplanted during the early part of the rains. But the subject is one which will not for some time attract public attention, as it should; not indeed till our Maulmein teak becomes scarce, which will not be many years more.

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* A moiety of the stock furnished to the Agricultural Society has been despatched to Capt. Burnett.—Eds.

Report of further tanning experiments with pods of the "Teree" of Chittagong, an undescribed species of Cæsalpinia, by Mr. JOHN TEIL.

I was duly favored with your communication of the 18th May, together with the extract of a letter dated March of the present year, from Mr. Sconce of Chittagong, with the *Teree* pods therein noticed, and which I have, after a series of experiments, to report upon as follows, viz.:—

1st. Pursuing my proposition in letter No. 272, of the 2nd June 1847,* I, on receipt of the pods in question, commenced the preparation of two thick buffaloe hides, for the purpose of tanning them, exclusively with the *Teree* pods, into which they were put in the usual form on the 10th of April last. The process continued apparently all right for about 5 or 6 days, but the tan did not appear to enter or affect the hides as I could have wished after that time, (although I had several times, as is usual, changed the stale liquor for fresh, with addition of new pods,) it gradually changed from the bright to a dark unnatural color, while I observed the hides to swell to an immense thickness, becoming as loose and as spongy in proportion until the end of the month (April). I concluded it would be useless to spend any more time, labor, or materials upon the hides in question, as I saw they would be of no use whatever for any purpose; but that I would make another attempt at similar hides, watching its process more minutely, as I imagined that some accident or another might have caused so extraordinary an occurrence.

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* This letter will be found in Part I. of the present Volume, p. 6—Appendix.—EDS.

I made therefore a second experiment on one buffaloe hide during the months of May and June, and although I exercised every precaution, I still had the same result, which led me again to try them on a thin cow hide and calf skins, the latter of which resulted so satisfactorily with the pods last year.

The pieces of leather accompanying herewith, marked respectively *A* and *B*, are the results of such subsequent trials, but which have not, I much regret to state, given the satisfaction I had anticipated, consequent upon the trials on a small scale I made last year.

The piece of leather marked *A*, is part of a country cow hide, tanned exclusively with the *Teree* pods, occupying as nearly as possible, a third of time longer than when tanned with *Babool* bark, or about 5 weeks, while the quantity of pods necessary to preserve it was immense, being about one maund for 5½ ℔s. of leather, while the quality of leather is not such as would be readily saleable, owing to its not possessing that lively and bright appearance, a color necessary for that purpose.

The other piece marked *B*, is a whole calf skin, something similar to that I submitted to the Society last year: this skin, with 11 others (in all 12), were treated with the pods in every way similar to that in 1847, but while that skin was tanned in four days with only 3 ℔s. of pods, these 12 skins (which ought to have been tanned in the same length of time) occupied as nearly as possible twenty-two days, requiring something more than two maunds of pods (without seeds) for their preservation, and even after so long a period I found several skins amongst the 12, very imperfectly tanned, while the color of them does not at all, in the present instance, encourage the use of the pod as a tanning material.

Upon a comparison of my present trials, with that upon the same article in 1847, and of their respective results, I am led to think, that the pods may have been subjected to injury, to which all tanning substances are so susceptible in various ways, such as,—

1st. Being gathered from the trees before they were thoroughly ripened.

2nd. Allowing them to remain too long on the tree, by which they are exposed, perhaps to rain and damp weather after they are ripe, and which would extract a great portion of their tanning matter.

3rd. The same effect would result from the pods being packed up the least damp, or from their having been kept in any place for any length of time, that was not perfectly dry.

But whether the pods here alluded to, have received injury from any one or a combination of the causes above noticed, I could speak with no certainty whatever, but am of opinion, that my second remark (from the appearance of the pods) is the most probable.

I send herewith for your inspection, two small parcels of the pods. That numbered 1, contains what appear to be *good pods,* while parcel No. 2, contains pods that I consider good for nothing, being to all appearance decayed, black, and possessing but very little if any tanning property, while the other pods in packet No. 1, appear to be quite fresh, of a light color, and full of astringency, and to the best of my recollection, are similar to the few you were good enough to send me last year.

This vast difference however in the quality of these pods, never once occurred to me till a few days ago, and I shall consequently make further trials, both on thick hides and thin skins, selecting for their tannage, only such pods as I consider good, and hope hereafter to have the pleasure of communicating a more encouraging account of them to the Society, than I at present am able to do.

I feel much encouraged to prosecute further enquiries, as to their properties as a tanning substance, from the fact, that the pods as they now are, form, in combination with oxide of iron, an excellent and fast black dye (and which would not be possible were they minus of astringent properties); as regards its quality for leather, I can speak of it in very high terms, it however required a considerable quantity to make a good dye, which I conclude was the result of more than half of the pods used being inferior, but of which I was not aware at the time. I have much pleasure in sending you a bottle of the dye in question, but since by recent discovery of the inferiority of some of the pods, I shall not fail to make a further trial, and forward to the Society, a sample of leather blacked with the same, and particularly of the process, when its quality and probable value could be better ascertained. In the meantime, however, I would suggest, a sample of the good pods being forwarded for trial by some practical dyer in England, who would be better able to test its value as a dye-stuff in the English markets, in comparison to those now in use.*

Kidderpore: 4th October, 1848.

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* This suggestion has been anticipated. Mr. T. M. Robinson, a member of the Society, has received a quantity of the pods from the stock sent by Mr. Sconce, one maund of which he has transmitted to Messrs. Learmouth and Roberts, of London, (Mr. Roberts is one of the most successful tanners and dyers in England.) Another maund Mr. Robinson has sent to Messrs. Lewis and Peat, of Mincing Lane, London, who will put it into the hands of some skilful dyer. Mr. R. has promised to transfer both reports to the Society.—EDS.

1. I am now happy to be able to give a favorable report upon the tanning properties of the *Teree* pod, so far as regards its application to skins only, from trials made with those received from you in the month of November, which have proved superior in every respect to the parcel received with your letter of the 18th May 1848, the results of which were given in my letter, No. 514, of the 4th of October.

2. Following the promises therein made, an experiment is now in process upon a stout buffaloe hide, which having been some months in manufacture, is not yet quite completed. I have however every hope, that in the course of three weeks or a month hence, to give a full report upon the same.

3. In the meantime I have the satisfaction to forward to you, three skins, tanned exclusively with the last parcel of *Teree* pods, received from you, which for distinction sake, I have marked respectively *A*, *B*, and *C*.

4. The skin marked *A*, which is in my opinion far superior to the other brown one, both as regards quality and appearance (its color being very bright), was tanned in the short space of 42 hours, in a strong decoction of *Teree* pods, having consumed during the process, as nearly as possible, 8 ℔s. including seeds, or half that weight seeds excepted.

5. The other brown skin marked *B*, which from its darker color, is inferior to that marked *A*, was subjected to a very slow process of tanning, occupying as nearly as possible 16 days, and plainly exhibiting, that the longer the pod in solution be exposed to the air, the darker it becomes, and the less valuable is its production of leather: from this cause, and the consequent necessity of frequently changing its liquor with fresh solutions, the consumption of pod by the slow process, is fully double of what is required upon the quick method.

6. The other skin marked *C*, was tanned with that marked *B*, and consequently underwent a similar process, but has

been subsequently dyed black, with a dye made by a solution of the pods with oxide of iron. The dye (a bottle of which is herewith sent) appears to me extremely good, of which the color of the skin will bear ample proof, and leave little doubt, that the article, if cultivated at a reasonable cost, could be extensively made use of as dye-stuff, but as to its value as such an article, it would be difficult for other than a practical dyer to determine.

7. I very much doubt, whether the *Teree* pod will ultimately prove suitable for tanning heavy and stout leather, and draw my supposition from the one now in manufacture, as exhibiting the same detriment, as noticed in the 5th paragraph of this letter.

8. As to its capability of being most extensively used, in the manufacture of light skins and fancy leather, I think the skin marked *A*, will readily testify, from its beautiful light color, combined with such softness and pliability, as would enable the manufacturer to use them for the most delicate colors, to obtain skins of which description, the gall-nutt is so extensively used.

The *Teree* pod does not, in my opinion, possess so much strength as a tanning substance as the gall-nutt, but is as nearly as possible equal to the oak bark. It however nearly, if not quite, equals the former as regards color, when treated as upon the skin marked *A*, and imparts, in my opinion, as beautiful a hue to its dye. I have therefore not the slightest doubt, that if the pod could be exported at a reasonable expenditure, and it should prove, that the substance would keep good and free from injury during so long a voyage, it would ultimately prove a valuable addition to the present known tanning substances.

Correspondence and Selections.

REPORT OF AN EXHIBITION OF VEGETABLES, FRUITS, AND FLOWERS, HELD AT BHAUGLEPORE, ON 27TH NOVEMBER, 1848.

(Communicated by Major T. E. A. NAPLETON, *Honorary Secretary Branch Agri-Horti. and Floricultural Society.)*

The first horticultural exhibition of the season took place in the Society's show-rooms, in the public gardens, on Monday, the 27th of November 1848, at 4 o'clock.

The attendance of European and Native gentlemen was great, and every one who honored the show with their presence seemed to take a lively interest in the proceedings of the evening.

The show of vegetables was not so fine as it has been on former occasions at this season of the year, but the circumstance of three days heavy rain, accompanied by a severe gale of wind having visited us at a season when we least expected it, viz. from the 14th to the 16th of October, will easily account for our first crops having been destroyed, and our second ones being unusually late.

The following baskets of vegetables were to be seen on the show-tables, the produce of our Society's gardens:

Peas, cauliflower, beet-root, new potatoes from Bombay seed, asparagus, turnips, carrots, Tenasserim yams, onions, French beans, love-apples (2 varieties), lettuce, endive, scarlet radishes, cabbage, plantains, brinjals, Caubool capsicums, Nepaul chillies, spinach, parsley, herbs, West India arrow-root tubers.

The following gentlemen were kind enough to do the duty of umpires: Mr. Cathcart, Mr. Alexander, Mr. Loch, and Muharaja Jyemungul Sing, and having inspected the *dalees* from our Society's gardens, pronounced every thing to be excellent, and highly creditable to the institution.

From private gardens there were an immense number of *dalees* brought for competition, and the umpires awarded prizes as follows:

To the gardener of W. S. Alexander, Esq., the sum of 5 rupees and 12 annas, for a bouquet of roses, a basket of peas, and for the best cabbage, French beans, radish, and chillies.

To the gardener of G. F. Brown, Esq., 1 rupee and 8 annas, for a bouquet of roses and a *dalee* of cabbages.

To the gardener of R. N. Shore, Esq., the sum of 3 rupees, for the best specimens of double *Zinnias*, radish, capsicums, and West India arrow-root.

To the gardener of P. Onraet, Esq., the sum of 2 rupees, for five superb yellow *dahlias*.

To the gardener of Captain Don, 2 rupees, for lettuce, cauliflower, and Jerusalem artichokes.

To the gardener of J. Glas, Esq., the sum of 4 rupees, for a bouquet of beautiful double pink *Chrysanthemums*, which, from their circular shape, general fulness, and pretty color, were mistaken for double daisies; also for double white China rose, West India arrow-root tubers, and Tenasserim yams.

To the gardener of J. Piron, Esq., 1 rupee, for the best basket of beet-root.

To the Cleveland house gardener, the sum of 11 rupees & 12 annas, for the best bouquet of roses (9 varieties), *dahlias*, sweet brier, *Durantas* (3 varieties), also for the best *dalee* of peas, new potatoes from Bombay seed, carrots, onions, Jerusalem artichokes, and nohl-kohl.

To the gardener of W. H. Brodhurst, Esq., 1 rupee and 8 annas, for a bouquet of *Gaillardia picta*, turnips and onions.

To the gardener of G. H. Grant, Esq., the sum of 2 rupees, for cauliflowers and beet-root.

To the gardener of R. C. Raikes, Esq., 14 annas, for a bouquet of *Gaillardia picta*, and a basket of turmerick.

To the gardener of Muddun Tackoor, Zumeendar, Kulan, 2 rupees and 12 annas, for new potatoes and the best *dalee* of indigenous vegetables of all sorts.

To the gardener of Baboo Gooroo Churn Mitter, 2 rupees and 12 annas, for the best yams, herbs, and 2nd best *dalee* of indigenous vegetables of all sorts.

To the gardener of J. Pontet, Esq., 2 rupees and 8 annas, for nohl-kohl, turmerick and water-cress.

To the gardener of Quarter-Master Serjeant Dowling, 2 rupees and 8 annas, for turnips, French beans and Cabool capsicums.

To the gardener of Moulvee Ubdoollah Khan, 12 annas, for the 3rd best *dalee* of indigenous vegetables of all sorts.

To the gardener of Moulvee Mahomed Rafiq Khan, 8 annas, for yams.

The following is a list of money and other donations since our last show in May, 1848.

From Melmoth Hall, Esq., Lehra, Goruckpore, the sum of Company's rupees two hundred on the following accounts: 64 rupees as a present or money donation on joining the Society as a subscriber—18 rupees on account of one year's subscription in advance, from the 1st of October, 1848—50 rupees as a money prize for the agriculturist or individual who shall bring to our next May grain-show five seers of unmixed white wheat. The wheat to be *Doodea* or any other white wheat, grown in the Bhauglepore or neighbouring districts. Jubbulpore, Kutmandoo, English or Scotch, &c. &c. to be considered foreign wheats, and not to be allowed to compete for the prize. Also the sum of 50 Rupees to the individual who shall bring to the same show five seers of the finest unmixed red wheat: all wheats, except those usually grown in the Bhauglepore or neighbouring districts, to be considered foreign wheats.

Also 18 rupees in payment of one dozen bottles of arrow-root, prepared in the Society's garden, from the finest West India tubers.

A donation of 25 rupees from a gentleman from Calcutta who visited our public garden in October, 1848.

The Honorable Sir L. Peel's annual subscription of one hundred rupees.

From Captain Swinton, 32nd N. I., a packet of pine seeds from the Himalayas.

From J. F. Cathcart, Esq., Civil Service, two orchideous plants belonging to the genus *Vanda*, natives of the Terai, with a painting of their beautiful flowers: also from the same gentleman, a money donation of one hundred rupees.

From Colonel Ouseley, Governor General's Agent, Chota Nagpore, three hundred coffee and fifty tea plants, also a fine supply of tea seeds.

From the Parent Society, two silver medals and fifty rupees, their accustomed annual gift, also a box of English cereal grains,* a fine supply of French beans, peas, white linseed, some vegetable seeds, also a splendid assortment of bulbs of rare Cape plants.

This opportunity is taken of making mention of the cereal grains having nearly all germinated very well, and the crops have now a most healthy appearance.

Most of the Cape bulbs have come up, and are looking very healthy; also a donation from the Parent Society of a splendid plant of the beautiful *Poivrea coccinea,* one *Cordia Sebestena,* and several other beautiful flowering plants from their new and flourishing garden.

From G. Wood, Esq., of Calcutta, a fine plant of *Ixora Japonica.*

From J. Piron, Esq., a plant of worm-wood.

From L. Manly, Esq., of Calcutta, several rare *Pelargoniums, Arums, Lagerstromœas, Euphorbia jacquiniflora, Begonia, Duc de Berri rose, Rosa Manlyana,* &c. &c.

From Dr. Falconer, Superintendent H. C. B. Gardens, a good supply of flower seeds and some English vegetable seeds.

From R. Lowther, Esq., Civil Service, some plants of the *Aristolochia indica,* some seed of double stock, lupins, wallflowers, &c. &c.

From Captain White, commander of the *Lord William Bentinck* Steamer, two bottles of lucerne seed.

From G. Drummond, Esq., Peergunge, Purneah, a large packet of English flower seeds.

From Captain Hamilton, commander of the Steamer *Indus,* a packet of Assam tea seed.

From Muddun Tackoor, Zumeendar, Kulan, Zillah Bhauglepore, a fine supply of Prussian-blue and marrow-fat peas.

From C. Smith, Esq., Civil Service, three packets of seeds of plants indigenous to the Cossyah Hills.

From W. S. Alexander, Esq., Civil Service, a bottle of *Ipomœa rubro-cœrulea* seed.

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* These grains were received by the Parent Society from the India House in October.—EDS.

From Muharaja Jyemungul Sing, the sum of twenty rupees, which he requested the Honorary Secretary to give as presents to the *mallees* of the public garden.

From Mou[illegible]e Reasut Ullee, Sheristadar Dewanee Adawlut, Mozuffurpore, the sum of twelve rupees, as a donation on joining our Branch Society.

List of New Subscribers since the last show.

G. C. Sutherland, Esq., Captain S. R. Tickell, C. A. Shillingford, Esq., H. C. Cave, Esq., J. Brandt, Esq., Robert Dowcett, Esq., R. S. Cohen, Esq., Charles Tucker, Esq., Robert Neave, Esq., B. Sapte, Esq., Robert J. Richardson, Esq., George Loch, Esq., A. R. Smith, Esq., Muharaja Chutturdharee Sahee Bahadoor, Dewan Nassir Ullee, A. Ogilvie, Esq., Samuel Smith, Esq., Raboo Keerut Sing, R. O. Haywood, Esq., Shaikh Deedar Ullee, Melmoth Hall, Esq., J. J. Ward, Esq., W. H. Smoult, Esq., Moulvee Reasut Ullee.

In the floricultural department were to be seen, from the Society's Garden, many beautiful bouquets.

The *Banisteria laurifolia, Oxalis,* many varieties of the *Passifloræ,* a real Forget-me-not, Geraniums, roses (10 varieties), double pinks, double *Zinnias, Durantas* (4 varieties), *Ipomœas* in great variety, *cum multis aliis,* were in lovely blossom. The undermentioned ladies most obligingly tested the specimens of flowers brought for competition, and awarded a great many prizes: Mrs. Alexander, Mrs. Trotter, Mrs. Diaper, and Mrs. Shore.

There was a vast improvement in the bouquets brought from private gardens on this occasion, which is a clear indication of the pains bestowed by the members of our Branch Society on the floricultural department of their respective gardens.

The Native gentlemen too, of this and the neighbouring districts, have of late imbibed a great taste for gardening in all its branches, and thousands of flower plants and fruit-grafts have been sent them.

Extract of Report on the Teak Forests in the Tenasserim Provinces.

To J. R. Colvin, Esq., *Commissioner, T. P.*

Dated Maulmain: 1[illegible] *May*, 1848.

Para. 2. I crossed the Kokareet Pass over the Donaw range, in the beginning of December last, and proceeded in a NE. direction to the Thoungyeen river, through the villages of Laydau and Meiplai. From thence I proceeded down the river, along its banks, to Thiepau's village, south of the Kamoklah hills. From thence I started southward towards the sources of the river, and endeavoured to keep as much as possible in the centre of the forests; having the Thoungyeen river about five miles on my left, and the Donaw range about the same distance on my right. Proceeding thus, I crossed the Meiplai river, and striking the road leading to the old town of Mierawaddy, I went along it half a day's journey, and reached the bank of the Thoungyeen a little above the ruins of the old city

3. At this spot I crossed the river to the Shan side, wishing to see the forests in that territory, and the actual effects of the mode of working them. Along the Shan bank of the river, I proceeded till I arrived opposite Papho's village, a little below the junction of the Meglar and Thoungyeen. I here re-crossed to the British side and marched up as far as I could towards the sources of the Thoungyeen, keeping the river a few miles on my left, until I struck it some distance above the junction of the Gauley and Paupee Khyoungs.* At the junction of these two streams the Thoungyeen loses its name, the main stream taking the name of the Gauley Kyoung.

4. I had thus gone through two-thirds of the forest by land, keeping as much as I could in the central tracts, penetrating further than any European before, and reaching a spot seldom visited even by natives. I determined on my return to inspect the forests in their whole river face; for which purpose I had a raft made at the junction of the Gauley and Paupee Khyoungs, and proceeded with great difficulty as far as Papho's village, just below the junction of the Meglar and Thoungyeen. Here making a more commodious raft, I floated down through the whole length of the stream, laying down the various streams, and the direction of the river; landing to make inspections whenever necessary, and passing through the precipitous gorges of the *Kyoukhet*, and *Kamoklah* spurs; until I arrived at the mouth of Wiensaw Khyoung, below which the forests were very insignificant. Although I had thus inspected the whole river face of the forest tract, there was still a locality the central portion of which I had not visited by land, viz. from the north face of the Kamoklah spur to Wiensaw Khyoung, including the land occupied by the villages of Wiensaw, Powatsau, and Gnathanyo. Accordingly, leaving the village of Wiensaw, I

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* Khyoung, "a small stream."

retraced my steps towards the south, keeping the river about 6 miles on my left, until I reached Gnathanyo's village; whence I returned by the same route to Wiensaw village and crossed "*en route*" to Maulmain by the Donaw Pass.

5. It will thus be perceived that my route lay through the whole length of the forests, midway between the Thoungyeen and the Donaw range, both by land as well as along the river face.

6. The region occupied by the Thoungyeen forests consists of an elevated valley, (about 800 feet higher than the Maulmain plains,) having the Donaw range on the west, and the range called the "Toungnyo," on the east. These two ranges, slightly trending towards one another, meet, and form a sort of "*cul de sac*" at the bottom of which rises, and through the whole length of which, in a north-westerly direction, flows the Thoungyeen river. It runs parallel to the Donaw range, which sinks gradually into the plains to admit of its junction with the Salween river. The Toungnyo range, as far as I could learn, runs due N., proceeding into regions unreached by our geography. I should estimate the whole length of this valley to be about 250 miles; its width, an average of 25 to 30. The Thoungyeen, keeping somewhat closer to the Donaw range than to the Toungnyo, divides the valley into two long strips. The one on the left or western bank being held as British, may average about 12 miles in width; the other, or Shan, about 15 or 18.

7. This valley is happily and conveniently divided into three parts by two mountain spurs; the southernmost being called the "*Kyoukhet*" or "Rocks of Difficulty;" the northernmost "*Kamoklah*," or "The Ruler's Rock," from a Talien prince and his suite having been wrecked and drowned there. Thus the valley may be considered as consisting of three portions. The highest and southernmost, from the sources of the Thoungyeen to the Kyoukhet spur, may be called the "Upper Thoungyeen." The next and largest portion, between Kyoukhet and Kamoklah may be called the "Central Thoungyeen," and from Kamoklah downwards, the "Lower Thoungyeen."

8. Both the bounding ranges of Donaw and Toungnyo, together with their spurs, consist of mountain limestone, presenting all the grey and grotesque appearances and cavernous issues of sudden waters (many at a high temperature) so characteristic of that rock. Their highest portions again are of granite, but of a composition in which the felspar greatly predominates; the quartz and mica being in very subordinate quantities. It is for this reason the weathered peaks get very rapidly disintegrated, the felspar rapidly decomposing into Kaolin clay; the fracture of such points presents the dead even appearance of a clay rock, rather than the sharp and angular edges of true granite.

9. It is from the disintegrated felspar of these weathered peaks that were probably, in a great measure, once supplied the deposits of stiff clay, which

we find playing so important a part in the economy of the Thoungyeen forests. These ranges are also said to be metalliferous.

10. Though the two narrow strips into which the valley of the Thoungyeen is divided by the river, belong to the same region of land, yet in their minor features they present a curious difference of physical aspect. The first thing that drew my attention was the circumstance, that, in proceeding down the Thoungyeen, whilst the British bank presented an innumerable succession of small streams and rivulets, most of them dry in the cold weather; the Shan side showed few or none of such, the mouths of large streams only presenting themselves, and in most cases these were dry. Whereas the only large stream of equal size on the British side (the Meiplai) was full of water. This is caused by the fact that whilst the central portion of the British forest-strip consists of a considerably raised plateau or ridge, the corresponding portion of the Shan side is depressed; thus all the water on that side is shed inwards into the depressed central portion, and when the level of this water gets above the mouth of the evacuating streams, the water flows into the Thoungyeen. When, however, it is lower, this central region forms marshy rice-land. Whereas on the British side, the central portion being raised, (as is well shown by an inspection of the map of the Central Thoungyeen) there is one mass of water shed directly into the Thoungyeen, another towards the Donaw range, which, with the drainage of those hills, forms the Mekanai Khyoung, the Lamma Kyoung, the Meiplai Khyoung, running north and south, till they meet and proceed in one channel eastward into the Thoungyeen, under the common name of Meiplai River.

11. This difference in the physical geography of the two tracts affects their respective forests in a remarkable manner. For, as on the Shan side, the forests only occupy the more elevated banks of the river, and the region along the base of the Toungnyo hills, there is left the low central portion for rice-land, by which (though unadapted for teak) a considerable population may be supported without trenching on the forests; and there exist consequently a great deal of *Lay* " wet, or permanent cultivation" there. Whereas an opposite state of things existing on the British side, and there being no large central tract adapted for permanent cultivation, (but only a raised plateau on which teak will not grow) the small number of inhabitants it can support are obliged to clear tracts of forest for the purpose of raising their crops of grain. Their cultivation, though on a plain, is therefore called *Toungya* "hill, or shifting cultivation."* It will be shown that these

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* Before the occupation of these provinces by the Burmese, the valley of the Thoungyeen was divided into four countries or jurisdictions, extending from the Donaw to the Toungnyo range, and supported a considerable Talien population. The chief cities, the ruins of which may still be traced were *Mierawadie, Dongnwey* (now Wiensaw), *Donggryeen* (now Ekalaik), and *Dong-Thoungyeen.* These were all situated on the now British bank of the Thoungyeen, whilst their rice cultivation lay on the other side of the river, now possessed by the Shans subject to Siam.

continued and continuous clearances of forest ground have a very disturbing effect on the forest vegetation.

12. A thorough appreciation of these forests cannot be given without a few remarks on their geological structure. The features of these are simple, but striking.

13. The great underlying rock is most probably the mountain limestone, of which the Donaw and Toungnyo hills are composed ; but in the valley itself this nowhere obtrudes itself to view. We find there the lowermost rock to be a compact sandstone, the upper portion consisting of a concrete of small rolled pebbles imbedded in a silicious matrix. On this reposes a deposit of large rolled pebbles, the depth of the bed varying from 8 to 14 feet. On this again, and of about the same thickness is a bed of stiff pure clay, supporting a layer of "humus" or soil proper, of from a few inches to a foot in thickness.

FIGURE 1.—These strata are generally quite horizontal, except in the upper Thoungyeen, where the sandstone has a dip of about 35 degrees.

14. It will be observed, that the newest deposit of the above is the stiff clay. It is this rock that the teak tree affects most particularly, and in proportion to its presence and thickness is the abundant growth of the tree.* The superficial deposit of "humus," or "soil proper," composed of the decay of vegetable matter, is not favorable to forest vegetation. It is evident, therefore, that whatever local causes affect the presence or distribution of these two beds, have a corresponding effect upon the nature of the vegetation that clothes them. One great disturbing cause is the washings or removals of surface caused by the heavy tropical rains. In a long sweep of country, such as the Thoungyeen forests, there are undulations and depressions of surface. Into the lowest of these the superficial soil is washed, is retained, and accumulates ; and we find one sort of vegetation. In places of an intermediate depression, where the influence of the soil predominates, but is yet mixed with a large quantity of clay, we find a second kind of vegetation. Till coming to the pure unmitigated clay itself, we find the forest reigning in all its grandeur.

15. We find these three stages of vegetation peculiarly marked. First comes the real forest, free from underwood, with its stately avenues and um-

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* This is the general rule, there may be occasional exceptions, which however will be found due to local peculiarities. A stunted teak for instance is sometimes found on the very summit of perpendicular cliffs many hundred feet in height, as also on the precipitous sides of a hill ; but then these are always composed of limestone, which, from its tendency to abound with cavities and irregular shelvings, enables clay and moisture to lodge. Again, teak is very often found abundant on low hills, but these hills will be found composed almost entirely of clay, as may be shown by the circumstance of elephants sinking deeply into the ground in mounting over them during the rains, as also from the excessive slipperiness of the soil. All this mark a teak soil. Whereas the portions occupied by fir and Engbeng are not at all softened by the heaviest rains, and receive no impression from the weightiest tread.

brageous trees, shading its dank and unripened bosom from the genial influences of the sun. Next and intermediate, are found growths of smaller, and as it were, more orchard-looking trees, such as the papaya, the wild sloe, and many wild fruit trees; as also the coarse tall tiger-grass, the scrub bamboo, &c. &c. The soil here, more accessible to the ripening effects of the atmosphere, has progressed a stage towards maturity. Last we find occasional sweeps of soft Savannah grass, the presence of which is a sure sign that the soil has fulfilled the full circle of its obligations towards the production of a cereal crop. Where such tracts sufficiently abound they are used for *laydau*, the "wet" or permanent forest cultivation. It will be perceived that the forest, depositing an endless succession of decaying vegetable matter, (which accumulates and forms "humus," or soil proper,) would, as it were, ultimately cause itself gradually to disappear, were it not that the disturbing and removing causes above alluded to, put off this catastrophe to an almost indefinite period. I consider these remarks of importance, as they should be borne in mind in the selection of localities for artificial nurseries. It also explains the reason why teak is found to be the most abundant in the vicinity of streams. It is a very great mistake to infer from that circumstance that the teak tree affects a damp soil; it is, on the contrary, a peculiarly dry and arid looking plant. Any attempt at planting it along the low banks of plashy streams would meet with failure.

16. Although the process, which I have described above, is that of nature, yet it can be hastened by the hand of man. By far the greatest cause of the destruction and disappearance of the teak tree is the cutting down and clearing the forest for the purpose of cultivation, or *Toungyas*. Although all the individual teak trees may be left standing, (as they generally are), yet the soil having been once exposed to the influences of the sun and atmosphere, the vegetation that re-appears is never of the original or forest kind, but of the intermediate or second stage. All the forests in the lower Thoungyeen, from the northern flank of the Kamoklah spur downwards, are gradually disappearing on this account. I have passed for days, through these deserted *Toungyas*, deserted long before the memory of man, and have never seen them reverting to their original type. Not but what, in the lapse of ages, the words of the Latin poet might not be applied to them,

> "Magnus ab integro sæculorum nascitur ordo."

17. In illustration of the above, I will here submit for your inspection, a section of the forests, from the Thoungyeen river to the Donaw range.

FIGURE 2.—The section is that of the tract, about 3 miles south of the Meiplai, running due east and west, and at right angles to the course of the Thoungyeen river, where the characteristics, which I have endeavoured to insist upon, are the most marked. This section shows very prominently the raised central sandstone plateau alluded to in para. 10, as inimical to the

presence of teak, simply because the clay has been washed off of it to the lower and more level land near the rivers. It is on this spot that are found the fir and Engbeng trees. This last is a tall straight tree, something like teak, with a white, light, stiff wood, and from what was said by a nautical person, who was for a short time in company with me, appears well adapted for spars and masts. In the districts immediately above and below the Meiplai district, to which the above section refers, this central plateau is conformably represented by a range of minor but precipitous hills, running more or less parallel to the Thoungyeen river and the Donaw mountains.

18. But if instead of taking a vertical section of the forests in their breadth as above, we take one in their length, we find the identically same peculiarities, though on a smaller scale. For instance, the one below is a section running N. and S. parallel to the course of the Thoungyeen river, of the tract of country called Thiepau's, south of the Kamoklah spur, and north of the Meiplai. I have chosen it, because it abounds in a greater number of little streams.

FIGURE 3.—A. Raised plateau of sandstone, without teak, also not elevated enough for fir, but covered with Engbeng.

B. Clay (resting on the bed of rolled pebbles) washed to the vicinity of the streams and covered with teak.

1. Maupoothoo Khyoung, (stream.)
2. Thickara do. do.
3. Thengan do. do.
4. Engyeen do. do.

It is thus evident, that if a person were walking over such an extent of country, he would find himself in a forest of Engbeng trees, then he would fall in with teak, and would know from its presence that he was in the vicinity of a stream, crossing which he would again find teak; then he would get among Engbeng trees again, and so on.

19. A superficial observer, therefore, thinks that this connection between teak and streams is on account of the presence of water, and that the plant affects a damp soil; whereas such is not the case. The reason being that in those localities, the stiff clay has been washed down and is enabled to lodge.

20. Having thus, at some length, given a description of the physical aspect and geological structure of the Thoungyeen forests, before proceeding to the next portion of my subject, I will make one remark, to which I shall have to refer hereafter, and that is, that when the clay, the presence of which is so necessary to the existence of teak, is largely mixed with lime, the compound thus formed, being the most favorable for the development of vegetation, we find in those districts through which the limestone spurs of Kamoklah and Kyoukhet have obtruded themselves, (the disruption of strata so created having caused their lime to mix with the clay,) that the teak, although,

perhaps, not quite so numerous, is yet individually of a far more magnificent and universally vigorous growth, some being full 18 cubits in girth. There are also very few if any trees of imperfect development.

21. Having thus mentioned the kind of soil on which teak grows, I will proceed to make a few remarks on the nature of its growth, and the mode of its propagation. Teak is never found in a forest entirely composed of individuals of its own kind, but in company with numerous other forest trees, all requiring the same contingencies of soil and circumstance, and having the same peculiarities of growth. Sometimes a patch of 30 or 40 young teak trees may be seen without almost any intermixture of other trees; but this is only in particular cases round some tree which is shedding its seed. Teak may be said to be very numerous, when it averages one in eight of the trees of the forest. It is thus evident that all the teak in a tract may be cleared away, without in any way altering the forest aspect of remaining vegetation.* The individuals of other families that remain, still enable the ground to keep up its original type. Therefore, if young teak were planted on such spots, all the contingencies would exist necessary for their progress to maturity. Whereas, if the ground had been thoroughly cleared, as in the case of Toungyas, the soil, having become altered, could only afford the requisites for a totally different species of vegetation.

22. The grand mode by which teak propagates itself is by seed. I have never seen a single case of a sapling shooting from the root; and in the Thoungyeen, only in a few cases, where the soil was adapted for a vigorous vegetation, have I seen the stump that had been left of a felled trunk, sending up shoots. The first spot on which I saw young teak in any abundance, was half a day's march beyond the Meiplai village; and after a careful examination of the locality, I found that they were evidently from the seeds of some partially decayed trees which had been left standing; and in every other case in which I met with young teak, I found that their presence could only be attributed to a similar cause. This is a very singular fact, but it is almost more singular how it explains many points, which appeared so difficult of solution, in reference to the self-propagation of teak. It is a remarkable circumstance that whenever I found a great number of fine vigorous and sound full-grown teak trees, I never saw any seedlings near them! But where these fine sound trees had been cleared away, and here

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* This observation is worthy of remark, as it shows that if young teak do not re-appear in the same localities from which wood-cutters have worked out the original teak, it is not because the ground or soil is altered. In such spots, viz., forests where the teak tree only has been cleared away, and all the other forest trees left, the place of the removed teak is, after some time, supplied by forest trees of the same kind as those that were allowed to remain. The second stage of vegetation described in para. 15, and which may be styled forest jungle, in contradistinction to forest *trees*, only makes its appearance, (except where growing naturally) on spots where wholesale clearances have been made of *all* the trees of the forest.

and there some old or deformed trees, or trees decaying from being covered by creepers, or with the large holes in them, &c. &c., existed, I found them accompanied by vast numbers of seedlings. It would thus appear, that with the mature trees injured in their growth, or trees progressing to palpable decrepitude, the vegetative force of nature not being called away to the formation of woody structure, or to the support of a large mass of substance, is directed to the effectual development of the seed. So striking is this fact, that one might almost think the plant gifted with volition, and that, conscious of decay, it hastened ere it disappeared to shed its representatives around it. I do not mean by this to say, that a teak tree in its prime does not produce seeds; on the contrary, it does so in abundance, but they never come to anything until the individual shall have reached the decadence of such prime.

23. This is the reason why, that in tracts where teak abounds, you always find it very nearly of the same size and age, either all full grown or half grown, or seedlings; still they are always palpably of the same generation. Not, as with mankind, where we find in every society a due admixture of old age, youth, and childhood.[*] Except that in the case of very young seedlings, there *may* be a few rapidly disappearing individuals of a former generation left. If my view then is correct, and we take a forest of fine

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[*] It is not to be doubted that there may be found occasional exceptions; but these, if any thing, would rather tend to confirm the rule. The first years of the existence of the teak plant appear to be occupied in attaining height. Thus a very few years difference in the age of two seedlings, offsprings of the same tree, makes an extraordinary difference in their appearance. And the elder, of some 15 years of age, would appear not of the same generation as the younger, of but a month's date. In the lapse of years, however, this disparity disappears, and the full grown teak tree, of 185 years of age, would equal in size and appearance one of 200 years. An illustration of this is shown in the case of a patch of very numerous young teak, about half an hour's march from the bank of the river in the march from *Khyouk-pouk Tsakan* to the Thoungyeen. Here some half dozen older trees have been shedding their seed for the last 15 years or so, and they are surrounded by seedlings varying in height from one foot to 20 and more. These last have almost the appearance of young teak in contradistinction to seedlings, and an instance at first sight appears of an admixture of "old age, youth and childhood," in reference to teak. But on examination it will be shown, that none of these apparently *young teak* have the marks of seed-capsules, whereas the old ones are covered with them; thus showing that the seedlings could not have been the produce of the young teak raised with them. Again, at times very young seedlings may be found without any old tree near them. In such cases the parent tree has fallen down, and got destroyed or otherwise disappeared, letting alone the many ways in which seeds may be conveyed by storms of wind, by birds, and even in the rough fur of animals, &c. It is probable that the remarks in the text with reference to teak, are just as applicable to *all* forests in a state of nature. Any one who has seen either the forests in the North of France, or Southern Germany, or even forest plantations in England and Scotland, must be aware that when standing in the middle of a given space which the eye can contain, all the trees are nearly of the same size, and thus he can see a considerable distance between the stems of the trees; whereas if these trees were accompanied by swarms of seedlings of varying height, the line of vision would be perfectly obstructed.

trees, the process would be this. Nature would first rear a forest of trees; they would grow up side by side, all nearly of the same size and age; when they had fulfilled the obligations of their growth, and were nearly all about the same time hastening to decay, they would simultaneously, before they disappeared, scatter their young around them. A new forest would thus rise, with individuals of nearly all the same size, to go through the same process. If, however, such a forest in its full prime were worked, the forester would hasten to kill every tree at once, and thus most effectually prevent the teak re-appearing.* If, however, there happened providentially to be some imperfect or malformed trees, or crooked in shape, or otherwise so injured as not to be worth bringing away, these would remain to form centres of propagation and the forest would revive. This is the reason why teak seedlings are so abundant in the middle and upper Thoungyeen; whereas, on the flanks of the Kamoklah and Kyoukhet spurs, as also on the Attaran, they are not to be found, except in very rare instances. From the great admixture of lime in the soil of these last mentioned districts, the vegetation is so powerful and vigorous as scarcely to admit of imperfectly grown trees, (in other words centres of reproduction,) they, being all in their full prime, are being killed, and are rapidly disappearing without leaving any representatives behind them.

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* "As a corroborative illustration of this point, the following extract is appended from an article entitled, TEAK FORESTS AND TIMBER TRADE OF THE TENASSERIM PROVINCES, from the *Maulmain Chronicle* of the 23d December, 1846.

"It has been remarked, that where teak forests have been worked out by the wood-cutters, that no young trees have been raised up in the same forests to fill up, and supply the places of the parent tree, but that forest trees of a different description invariably spring up and occupy the ground from which teak trees have been taken away. This curious fact is well known to the Karens and Burmese wood-cutters, and has no doubt been noticed by many European observers before. The reason that might be given for this is, that the ground has exhausted its strength in bringing forth and rearing to maturity the vast forest of trees that cover the face of the country, and is not in a state to support and nourish another generation of young trees. Young teak are, notwithstanding the above remarks, very plentiful, springing up spontaneously in new localities. They are scattered about in many places, the young plants choosing as it were new spots and tracts where no old trees exist. Whenever the soil is congenial to their growth they thrive well, and do not require assistance; unassisted nature alone takes the task of rearing teak trees for future supplies, and will do so more efficiently, than by any artificial nurseries that may be made by man. From the number of young teak trees found growing scattered in every direction, there is no reason to apprehend a want of teak for the future, although it is by no means improbable that before the young trees attain a mature age and are fit for cutting, the teak trees worth felling will be exhausted."

With reference to the above extract, it is very evident, from its own showing, that the reason why young teak do not appear in localities "where teak forests have been *worked out* by the wood-cutters," cannot be because the ground has been exhausted of its capabilities of again rearing a forest type of vegetation, seeing that it is immediately said "that *forest trees* of a different description invariably spring up and occupy the ground from which teak trees have been taken away." Again, the circumstance of young teak being found generally all of the same size, and not mixed up with mature trees is noticed. But if by their springing up *spontaneously*, it is meant that the soil produces them by any creative energy it may have in itself, or in other words by equivocal generation, and that they are not the produce of the seeds of some parent trees, it is to be feared that modern botany would scarcely concede to "*unassisted nature*" the possession of so strange a power.

24. In the middle and upper Thoungyeen, the greatest enemy to the teak tree is a species of parasitical ficus. It is curious to see the process by which this plant entirely destroys a tree. At first, under the guise of a slender and graceful creeper, scarce the thickness of a finger, it appears only to appeal for support. In its second stage it may be seen spreading out the woody structure of its stem and shooting its light foliage far above the original tree, yet appearing, however, to vegetate with it, as it were on equal terms. Till last comes the closing scene, the parasite has entirely enveloped the original tree in its deadly folds, and absorbing all the juices of its life, nothing remains but the projected stump of some withered arm, to show that any other plant had once been there. Yet, this parasite appears never to attack trees of a perfectly vigorous and healthy growth; and thus it is that I have never seen a single instance of its presence in the forests of the Attaran or of Kamoklah and Kyoukhet.

25. I have but a few remarks to make on the Attaran forests. The only tract in that part which I was enabled to visit were the forests on the Zimmay branch of the Attaran; having been disabled by illness from proceeding to the Wienyo.

26. The forests in the Attaran river are not like those on the Thoungyeen, situated on an elevated plain. The whole extent of country being on the same level as the plains of Maulmain. I found, however, the same kind of soil obtaining as on the Thoungyeen; namely, clay resting on compact sandstone, but the bed of rolled pebbles, and concrete was absent. The underlying sandstone, likewise, instead of occupying the prominent part it did in the Thoungyeen forests, even altering the nature of the superincumbent vegetation, was very subordinate, and would in a great measure escape the notice of a casual observer. The Attaran plains are intersected by several ranges of hills. The most easternmost, being one called the Toungwine, separates the forests on the Zimmay from those called the Upper Mitigate. Between the Zimmay and the Wienyo again, is another range of hills bearing various detached names. And to the west of the Wienyo is a third range intervening between it and the sea. All these three ranges are composed of limestone; they are somewhat low, but very precipitous, and their peculiarity is that they do not consist of continuous ranges, but of small detached ones, all running N. and S., and occupying different positions in the plain and at varying distances from the streams. The consequence is, that the original clay has been much mixed with their lime, and the soil is of the same marly nature as the forest tracts on the flanks of the Kamoklah and Kyoukhet spurs. The vegetation likewise is exceedingly vigo-

rous; the underwood in many places impassable. The Attaran teak is therefore much more rapid in its growth, attaining a larger size in a shorter time, and is altogether of a far more compact and sound substance.* On account of this propitiousness of soil and consequent vigour of vegetation, it happens that scarcely any imperfect or malformed trees, or trees decaying in their growth, or (as I have before shown) in other words, centres of propagation, are to be met with; and ergo, no seedlings. This absence of seedlings is a characteristic mark of the Attaran forests.

27. The only way in which reproduction could take place in the Attaran forests, would be by leaving a few trees scattered over an extent of country, to grow old, die away, and produce seedlings during the latter period of their existence. But this is prevented; for any tree that can possibly be a source of gain is cleared away. And from the accessibility of these forests, their short distance from Maulmain, and the navigation of the river offering no obstacles, any crooked or deformed trees which may exist, and would have been left standing in the Thoungyeen, as not worth the expence of removal (and therefore ultimate sources of germination,) are in the Attaran forests cut for the purpose of supplying crooks for ship building.† Thus it is we are thrown back to a former period, when these forests were allowed to go through the processes of nature. The young teak (in contradistinction to seedlings) which we *do* find on the Attaran, are representatives of seeds that germinated some fifteen, twenty, or thirty years ago, when the plant thrived unvexed by the presence of man. Another peculiarity is, that the force of vegetation being so powerful in the Attaran, stumps of felled trees invariably throw out a number of sprouts, which, after attaining to a certain height, become very crooked and thus afford a continued supply of crooks.

28. The Attaran teak affects the banks of streams not on account of any partiality for water, but merely because there, as in all flat countries, the land immediately bounding the stream is the highest. The land extending between two streams is like a saucer, lowest in the centre; and however adapted for rice cultivation, is invariably shunned by teak.

29. I have already alluded to two existing causes of injury to teak. 1st, The formation of Toungyas. 2nd, A parasitical creeping ficus. I never found one instance of the last in the Attaran forests, as it would appear that this foe never attacks any but plants of a less vigorous growth. The first likewise is very subordinate in the Attaran. The Karen population is very scanty (although there is going on a steady immigration from the Siamese states.) But in any case the Attaran forest districts could support a nu-

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* Vide Tabular Statement *A*, appended, showing the girths of trees of different ages in the Attaran and other forests.

† Vide Tabular Statement *B*, showing the proportion of crooks to logs of all sorts which came from the Attaran, and from all the forests, foreign and British, via the Salween river.

merous population without in any way interfering with the localities affected by the teak plant. For as the whole extent of country is a plain, intersected by an immense number of streams, and, as I have ālready remarked, the central portion between two bounding streams is the lowest, there is to be found there, an accumulation of moisture and soil adapted for rice.

30. A third supposed cause of interference, is the injury done to young plants by allowing a tree when felled to fall of itself and not lowering it with ropes, &c. I think that such causes of injury are so slight and local as not to be worth notice. Timber is expressly and invariably dragged in the wet weather, when the surface is moist and slippery, because it thus requires one tithe of the labor necessary in other seasons, when the surface is rough and impeding. For the same reasons foresters, in dragging a tree, go out of the way to get into a track formed by a preceding log, which has smoothed the way before it.

31. But there is a fourth and last supposed source of wholesale destruction to teak forests, which has been often insisted on in unmeasured terms, and which consequently deserves a careful consideration. I allude to the periodical fires which take place in the month of April, when all vegetation is so dry and parched up, that even the ashes of a passing pipe might set a whole kingdom in a blaze. These fires are generally caused by persons burning the vegetation they have felled, for the purpose of clearing a space for cultivation, but are also very probably occasionally spontaneous.

32. It is astonishing how the effect of these fires have been exaggerated. There is something so grand and awful in the phenomena which attend their path, that the mind is naturally pre-disposed to fancy their effects must be as fearful as their appearances. It is easier to imagine than to describe the progress of one of these great conflagrations ; whirling in wild gyrations over forest and plain ; sweeping in eddies round some spot, which all human speculation had doomed as its inevitable prey, leaving it unscathed ; and hastening to the destruction of some locality which appeared safe beyond its utmost verge. It may thus be seen crossing the beds of deep streams, sending the messengers of its march far before it in the shape of long flakes of igniting matter. Seeing, then, how freakful and exulting an enemy it is, and how it mocks all control, it seems futile to think of circumscribing its career, or even modifying its course, by digging trenches or clearing small circumferences of jungle. From the accounts one reads it would appear almost as if the element was endowed with a powerful volition, and very much given to the destruction of young teak. Recurring, as these conflagrations probably have done, through a long succession of seasons, if their effects on the youthful vegetation were really as destructive as supposed, they would long since have converted the forest into plain. Whereas each indi-

vidual is as stately and each family as numerous as when vegetation first began to clothe the bosom of the ground.

33. It should be remembered that though the fire may consume the stem of the young plant, it does not consequently injure the root. It is surprising to what a small depth of soil the heat of a very great conflagration is able to penetrate. Each successive destruction of the stem throws accumulating vigour into the root; till at last, aided by the ashes of its former self, the plant is enabled, during the interval of visitation, to shoot itself safe beyond the influence of the destroying element. This fact is curiously shown by the circumstance that when a number of seedlings are found at the foot of some parent tree, and the surrounding ground bears the palpable marks of the last fire, the seedlings varying in height from 1 foot to 12 and even 15 feet, will be found free from the slightest marks of fire. It is evident, therefore, that they must have all sprung from the ground at the same time since the last fire; although, from their varying heights, and concentric wood-rings, actually seedlings of different years. Another illustration was in the case of two seedling trees in the Attaran, near the Goonghee creek. They were both within nine feet of one another, near a solitary old tree, which was evidently their common parent; they were both nearly the same height of 15 feet. The ground, and every object around, bore the marks of the last conflagration, and the only difference was, that whilst the thickest and eldest was smirched with smoke, the stem of the other was perfectly clean, showing that *it* had sprung up after the last fire. Thus the elder had already successfully withstood the effects of the last fire, whilst the younger, having since that date reached the same height, and nearly the same substance, would probably be as victorious over the succeeding ones. It should be remembered, that it is the long dry grass and crackling underwood, which supply the devouring element with life. Hurried on by the terrific draft itself creates, the slightest pause would be fatal to its career. A tree full of sap and green vigour requires a regular roasting before it will succumb; with such the fire does little more than flicker up the trunk, licking off the dry moss and unsightly parasite. It destroys only those trees which have been felled and left lying on the ground, the effect of a conflagration on such prone trees is most destructive. In the wide extent of forest I have visited, I have never seen a single instance of a healthy and sound plant permanently injured by the fires. Again, if we take into consideration, the fact that every tree brought into the market is killed and allowed thoroughly to dry and season for three years; and is in this state exposed, *standing*, to the attacks of three successive conflagrations, and that few bear the slightest marks of fire; it will be evident that the destructive effects of annual fires have been much over-estimated. I cannot but think, therefore, that any money expended in the prevention of the attack of these fires will be thrown away. The more so, that taking into consideration how rapidly a dense and stifling

underwood springs up in this climate, it is probable that so summary an admission of ventilation, just before the setting in of the rains, is highly beneficial to the nobler plants of the forest.

* * * * * * * * * *

79. I will now refer to the subject of nurseries or artificial sowings of seed. The remarks which I have already hazarded, on the mode of the spontaneous reproduction of the plant, will render this subject much more simple.

80. Self-sown seedlings being so abundant in the Thoungyeen, there would be no need of nurseries there, except, perhaps, on the flanks of the Kamoklah spur. It is on the Attaran, where the plant is rapidly disappearing, from the causes I have already alluded to, that some artificial measures might be adopted.

81. I have, at some considerable length, dilated upon the circumstance of the seed of a still growing vigorous teak tree not germinating. I do not mean to say but what there may not be some rare exceptions; but the broad fact, I feel assured, will only be confirmed by further examination. It may be said, that, perhaps, the reason of seeds not germinating in the presence of vigorously growing plants, is not so much from want of germinating power in themselves, as from the ground, already taxed to the uttermost for the support of one giant brood, refusing to exhaust itself by attempting to rear another. To this, however, I cannot agree, as I have seen many instances of vigorous young plants, rarely scattered here and there, from 15 to 20 years old, covered with the empty capsules of fallen seeds, and yet having no seedlings around them. The only modification of my opinion, which I could concede, is that in favorable circumstances, where the teak has been pretty well cleared away, those vigorous young plants which are left, may produce, by the kindly force of nature, germinating seeds, sooner than they would have done had they been in a crowded company.

82. It is well known that every attempt at artificial sowings have proved a failure. I will endeavour to point out what I consider the reason, viz. that instead of imitating nature, her processes have been strangely violated.

83. One locality was selected for planting seeds, because, from the number and magnificence of the teak trees on it, the ground was argued to be peculiarly favorable to the plant. What I have already pointed out, (viz. the fact of seedlings not being found in the immediate presence of vigorous trees,) will show that this was just the very reason why it ought to have been shunned. Again, on the next and last occasion, a space of ground was cleared and kept clear, long ridges were thrown up, on which seeds were planted in drills and rows, and were expected, like the teeth of the dragon Mythology, to start up in files and platoons. Here again the feelings of nature were violated, the access of the sun and the infringement of the rain, altered the nature of the soil, and robbed it of its capabilities of raising a forest type of vegetation.

84. I would, therefore, recommend that in the case of artificial sowings, the process of nature be imitated as much as possible. I would select a locality, in every respect preserving its forest type, on which there was little or no teak, but which had once been a notoriously favorite locality of the plant. I would then proceed to sow the seed with spargent hand, without any regard to regularity, and system or arrangement. And although, perhaps, I would not have sufficient presumption to imitate nature in her higher combinations, and set fire to the seedling in order to see it rise again, as if refreshed with sleep, yet I would leave it entirely to the varying vicissitudes of its fate, and try if by that means I could not see a vigorous healthy brood arise, instead of one single sickly solitary exotic. For it should not be forgotten, that out of the many hundreds of thousands of seeds planted by government, one only has come up.

85. With reference to the proper time of killing or girdling the teak trees, I must mention that the Karens declare that they ought to be killed in September, just as they are getting into full flower. They say that then the tree dies sooner, the bark comes off easier, and it seasons quicker. On this point I can form no opinion, as I think it ought specially to be referred to a scientific botanist "whether the girdling a tree in full flower is detrimental to the wood."

True extract.

(Signed) Thos. Latter,
Superintendent of Forests, T. P.

A.—*Abstract of centre Girth of* 170 *Logs of various kinds of Timber.*

Description of Timber.	Ages.	Average centre Girth.		Increase of each period.		Remarks.
		feet.	in.	feet.	in.	
70 Logs of Thoung-yeen timber. ..	under 80 6 Logs.	4	10	,,	,,	
	80 to 120 22 Logs.	4	6	Less than above.		
	120 to 160 23 Logs.	5	9	,,	11	
	160 to 200 5 Logs.	7	10	2	1	
	200 to 240 9 Logs.	8	,,	,,	2	
	240 to 280 3 Logs.	8	1	,,	1	
	above 280 2 Logs.	9	11	1	10	

Description of Timber.	Ages.	Average centre Girth.		Increase of each period.		REMARKS.
30 Logs of Thoungyeen timber brought down on contract. N. B.—Undersized logs selected. ..	under 80 12 Logs.	3	3	,,	,,	
	80 to 120 17 Logs.	3	8	,,	5	
	120 1 Log.	4	9	1	1	
50 Logs of Attaran timber.	under 80 8 Logs.	6	1	,,	,,	
	80 to 140 12 Logs.	6	5	,,	4	in 60 years.
	140 to 180 20 Logs.	7	2	,,	9	
	180 to 220 6 Logs.	7	7	,,	5	
	220 to 260 3 Logs.	8	3	,,	8	
	283 1 Log.	7	5	,,	,,	
20 Logs of Lhingbway timber. ...	under 80 5 Logs.	4	2	,,	,,	
	80 to 120 14 Logs.	5	1	,,	11	
	130 1 Log.	5	,,	,,	,,	

B.—*Memo. of the number of Rough Logs, Ship Crooks, Boat Crooks, Sten Pieces, imported into Maulmain.*

	By what River.			
	Salween, Thoungyeen, and Gyne		Attaran.	
	Number of Logs.	Number of Ship Crooks, Boat Crooks, and Stem pieces.	Number of Logs.	Number of Ship Crooks, Boat Crooks, and Stem pieces.
From 6th June, 1843, to 30th April, 1848, ..	96,180	10,282	26,548	26,118

Extracts from previous reports in the office of the Superintendent of Forests, referring to the subject of young Teak.

Extract of a Report from Captain C. S. GUTHRIE, *No.* 240, *of* 20*th June,* 1846, *to Commissioner of Tenasserim Provinces.*

Para. 14. *Middle Thoungyeen.* Meerawaddy to Meiplai. From what I saw, and from as much information as I could procure, I estimate the number of teak trees at 5,200, exclusive of seedlings which abound; viz. above 6 feet 1,200, below 6 feet 4,000. The teak here was not of fine growth, and appeared to suffer more from large parasitical creepers than any other tree.

Meiplai Creek. I did not visit, but have received information from Mr. Maling, who worked it last season, and from others. The estimated number of trees is 6,400; 2400 being full sized. This locality is described as being easily worked, and the trees of fair straight growth. Young trees are in abundance; there are about 2,100 trees fit for felling, most of which I have reason to think are undersized.

Meiplai mouth to Kamoklah. Teak seen in considerable plenty on both sides of the river; landing repeatedly. I was disappointed in the appearance of the teak, very probably from all the fine trees being felled near the river. On reaching Kamoklah, I ascended the hill. I saw many first class trees, and have little doubt that much fine timber will be procurable from this locality. I estimate the contents of these forests at 13,000 full sized, and 16,000 undersized, exclusive of seedlings, which are in considerable numbers.

Kamoklah to Wiensaw. From the former place to as far as Tigahore stream, containing a number of very fine young trees, the best forest I had seen, I find in my note book, "Note.—This locality should be reserved for any Government purpose." There is some difficulty in dragging the timber, on account of many small hills and water-courses. Below Tigahore to Weinsaw, the trees run small. The total estimated number of trees 23,070; 5,070 being full sized; the very young teak is not so plentiful as above Kamoklah.*

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* The absence of seedlings on the flanks of the Kamoklah spur is noticed, para. 23.

The northern flank alluded to by Capt. Guthrie was much worked by natives, long before any European had ever visited it, and it is more strikingly deficient in very young teak (seedlings) than are the forests on the southern flank, or above Kamoklah. The forests on the northern flank of the Kamoklah, from Tigahore to Wiensaw, were of the type of the Attaran forests, viz. all vigorous sound trees, growing on a marly soil. Most of the trees were killed in their prime by natives, before having produced germinating seeds, and therefore there exist there few seedlings; as noticed in the text by Capt. Guthrie.

48. Extensions of forests by artificial means. I quote from D. Helfer's Report regarding the system of artificial extension of forests. "I would differ from that adopted by the Dutch in Java; it is an old expression, that forest trees do not thrive well if they are treated like fruit trees, or other delicate plantations. The system of nature should be imitated. No nursery beds and no transplantation should be employed. After having cleared the jungle in the chosen places, and after having loosened the soil sufficiently to receive the seeds and to be able to cover it with a little earth, I would advise the seeds being disseminated without any further care. The plantation must of course be enclosed to prevent the disturbance by any kind of wild animals. After two or three years the plant, when sprung up too close together, ought to be thinned, besides jungle parasites and other impediments removed. This easy operation should be annually repeated in dfferent parts of the country; over wide tracts, localities affording facilities for the transport of timber, such as rivers and nullahs, ought of course to be the first chosen."

(Signed) C. S. GUTHRIE, *Capt.*

Extract of a Report from Captain C. O'BRIEN, *to the Commissioner of Tenasserim Provinces, dated 21st April,* 1844.

Para. 9. Crossed the river and examined a teak forest on the Meypo river, which runs into the Lhingbway from the north-west.

Six furlongs from the bank of the latter river crossed a branch of the Meypo, known as the Chambariew; within this space are a few fine straight trees, the greater number of which have been killed by a Karen who has a grant. On these hills are scattered trees of large growth. Many fine trees are also immediately south of the boundary stream. Of the hill trees I measured one 11 feet 6 inches in circumference; another, age 250 years, (progressing to its 280th,) circumference at the smaller end 8 feet 2 inches. From a tree which had fallen, uprooted, a short log had been cut, which showed it to be perfectly sound at 10 feet from the root, age 185 years, circumference 7 feet 10 inches. During my tour through the various forests, I have never seen a seedling teak till to-day, but here found them very numerous above the boundary stream, where young teak occurs for some distance, almost unmixed with other forest trees, and are apparently very flourishing.* I have hitherto ascribed the total absence of seedling trees in the forest to the circumstance of the numerous fires that have taken place in every part of them since they have been worked, consuming the young and tender trees, and still believe such to be the case.

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* It is worthy of note here, that these seedlings, seen for the first time by Capt. O'Brien, appear to have been in company with very old trees, as shown by their recorded age, some having even succumbed through age. These old trees appear also to have been "scattered," and not crowded, and the whole is a corroboration of the views advanced above.

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The prevention of such fires will, I fear, prove a matter of extreme difficulty. The absence of seedlings may, however, be attributable to the nature of the tree; the seed is perfectly round, hard, and light; about the size of a small hazlenut, and is shed in February and March, when the ground is dry and hard. It is therefore, readily removed by the first rains into the beds of the small streams, and thence to the rivers, and tide water, or low situations, which are unfavorable to its growth; and it was justly remarked by Captain Tremenhere, when with me, that the teak is almost invariably found on that side of the stream on which the bank is lowest, where the seeds has probably been deposited, or accidentally arrested in its course. We had a strong proof of the inaptitude of teak to propagate itself on the Weinloung river, (in the Attaran) on the 11th of March, where we met with a clump of fifteen trees, no others occurring for several miles, and of these two or three were full grown and apparently vigorous trees, whose seed had been shed on this spot for probably upwards of a century.[*] The ground on which the seedlings are found (on the Lhingbway) is remarkably flat, small rills running all through it. The bed of the Meypo, from its tributary sources, as well as the plains on its banks, is of limestone formation, and I should think, from the straight growth of the present timber, the number of fine young trees, and the self-sown seedlings, this is the most favorable locality I have yet met with for forming a nursery, or sowing seed along its whole extent. The trees near the main river, killed by the Karen, afford a valuable proof, from their straightness and size, that the soil in the lower part of the stream is equally favorable to the growth of teak, as when we find them so numerous towards its source.

(Signed) C. O'Brien.

Extract of a Report from Mr. Smith, *Assistant Surveyor, Forest Department.*

With reference to the teak in the Meiplai district, I have the honor to state, that I observed between the mouth of the Meiplai and the Mekanai khyoung but few trees. These were, I believe, in every instance in dry situations. Among some patches of very old trees, I noticed an abundance of seedlings. On the Mekanai khyoung are a few small patches of teak. On the Lamma khyoung, near its mouth, saw two patches of old with young teak. Continuing up the Meiplai, I noticed but few patches of teak. On the left bank of the Meiplai, up the Pantaroon khyoung, teak is abundant. Near the site of the old town of Hlinewaddy, westward of the Meiplai, saw a patch of ten large and many seedlings. Between the mouth of Lamma khyoung and Kyouk Pouk road, saw a patch of six large trees and many seedlings; also another lot of fourteen trees on the left bank. Near Tathoo khyoung saw two patches of teak on the left bank; also thirteen trees by the Teewablaw khyoung. Towards Pyeemah khyoung, saw only three or four trees. Going on to Thaidoo khyoung, passed two patches of teak on the right bank; to Nyabalaw khyoung, passed a lot of eighteen trees on the left bank; further upwards, by the Makkah and Teewakalike khyoung, on the left bank, passed large quantities of teak, growing on the hill sides, but there were few very old trees or young seedlings. On the south-west flank of the Kamoklah, passed many fine teak trees, growing on the steep sides of the hill, but they were in situations difficult for their removal. These were the last noticed in the Meiplai side of the hill. Of the trees above noted, none were growing in wet or moist places.

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[*] Here again is described a clump of young fine teak trees, some two or three of the elder ones, of which it would appear had reached maturity, and were in great vigour, and yet their seed had been ineffectually shed for many seasons. Whereas the seeds of the very old trees, rarely scattered, mentioned in the first portion of this extract, had germinated most effectually. This also corroborates the remarks made in para. 22.

(Signed) W. SMITH.

ON THE CULTIVATION OF GUINEA GRASS.

To JAMES HUME, ESQ., *Secretary Agricultural and Horticultural Society.*

DEAR SIR,—I have the pleasure to send you a paper on the culture of Guinea grass, which I hope may deserve a place in the Journal of the Society.

The paper, from the name on the face of it, appears to have been addressed to Sir Wm. Jones, in 1793.*

Your's faithfully,

Katsooly : 17th October, 1848. THOMAS WATKINS.

GUINEA GRASS.

The cultivation of Guinea grass in the western parts of our provinces, would unquestionably be productive of the greatest importance and advantage to the country; and even here, where the fodder for cattle is extremely bad, and often scarce, it might be worthy of regard.

The want of good fat oxen on the momentary emergency of a war, for which this country should never be unprepared, would be of no trivial utility, and would obviate many inconveniencies to which our troops are liable even on the yearly relief.

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* It is included in "a Treatise on the cultivation of Sugar-cane and manufacture of Sugar," by W. Fitzmaurice, which was published in Calcutta in 1793, and dedicated to Sir Wm. Jones.—EDS.

Guinea grass, which grows on the most sandy desert or mountain, when it has once effectually taken root, puts it almost beyond possibility again to eradicate it, it is perhaps the best fodder produced on earth, its properties in the conclusion.

Preparatory to planting, let the ground be cleared (by burning) of all other productions, set the people to dig shallow holes through the field in regular rows, at the distance of four or five feet asunder, or at the distance of ten feet in case of a scarcity of seed or plants.

When the ground is thus prepared, at the commencement of the rains, plant four or six grains of the seed, or half the number of slips of old Guinea grass in each hole, slightly covered with mould, with the ends of the slips open to the air, planted across the hole, they will in two or three days shoot forth young grass.

Four or five weeks after the grass is planted it should be well cleared of all other weeds and shrubs, the roots moulded up, and so on until it begins to seed, when it should again have a thorough cleaning, and let it remain till the seed is dropping off: at this time it will be five feet high, then the stock should be turned into it, the cattle feeding over the field of grass help to trample and plant the new seed in the ground; when the grass is sufficiently trampled in the earth and eat down, it should be cut close to the roots, and a fire set through it, but should be done as the rains begin to fall, the grass will then spring up as thick as clover, and is ever afterwards established, and fattens the most reduced horses or bullocks in a few weeks; stock has been recovered by Guinea grass in America, which were so low, that when put into this kind of pasture they lay down and fed on the grass on each side within their reach, till they gained strength, and afterwards improved so fast that they appeared almost like wild cattle in less than two months, or by the time they were wanted to work in the mills.

Guinea grass in Jamaica, previous to the American war, was cultivated only on those plantations which could afford a small piece merely for recovering lifting steers* after crop, and if a sugar-work had fifty acres under grass, it was considered a great deal; there were then no more cattle bred than were barely sufficient to supply Saint Jago de-la-vega and Kingstown, with beef at 20 pence per pound; the plantation never saw fresh beef, they were obliged to live upon salt beef from Ireland, and their poultry, the island of Cuba supplied Jamaica with oxen, horses and mules, to the number of 50,000 annually, for which the Spaniards drew an immense sum in specie from the islands, and proved extremely distressing to the British planters; this trade it is probable would have continued since, were it not for the American war, by which salt provision, in the first place, rose to an extravagant price, and but very little was brought to the island; the trade being diverted by various casualties elsewhere; the Spanish war put an end to the Cuba trade (as it was called) and the army and navy's demands rose fresh provisions to a most grievous price; as necessity is well called the parent of industry, the small settlers turned their attention to the breeding of stock, great tracts of the interior wood-lands were cleared away, and formed into extensive Guinea grass pastures, and as expeditiously converted into breeding penns; on the fourth year, after the distress occasioned by the non-importation of cattle from Cuba, it was amply obviated, and the great inconvenience arising from the extravagant price of fresh meat, was remedied, as beef fell from 20 to 5 pence per lb. This successful effort gave birth to another, a charming breed of English horses was introduced, and at length an English breed of oxen; the ready cash before annually drawn from the island by the Spaniards, was now circulated on the island to the advantage of the Guinea grass planters. Hence it was that the cattle in Cuba became so numerous, that the Spaniards now frequently kill them in the open field for the sake of the tallow and hides, leaving the flesh to the birds of the air; there was not an acre of Guinea grass in the whole island of Cuba, it being all in valleys and plains of common pasture.

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* The steers which work in the waggons carrying the sugar to be shipped, are often so reduced by the end of the crop, that when they lay down they cannot rise without assistance.

It was computed, that between 1772 and 1792, 150,000 acres of Guinea grass were planted, and 30,000 head of stock annually raised in Jamaica; notwithstanding that increase, the price of working steers, horses, and mules, kept up on account of the annual demand; for the sugar estates, only breeding farms in the West Indies, take three years to establish them, but the capital required here would be so trifling in comparison, and the advantages of every other kind so many, that it would require both less time and trouble, to which we may add the great difference between the price of labor in the East and West Indies.

To the colony of South Wales, Guinea grass farms, to support a good breed of stock, would soon remedy all the disadvantages there complained of, and at the Andamans, it is worthy of consideration, how far it would prove useful there, the island being situated centrically for the exportation of cattle on emergency, or victualling of merchantmen.

It would be only requisite to clear away the underwood at the Andamans, for the cultivation of Guinea grass. In Jamaica all the timber trees are spared in clearing, to be cut down for use when wanted.

Some account of the Nutmeg and its cultivation. By THOMAS OXLEY, ESQ., A. B., *Senior Surgeon of the Settlement of Prince of Wales' Island, Singapore and Malacca.*

The *Myristica moschata*, or true nutmeg, is known to botanists as a tree belonging to the Natural Family Myristicacæ, Class Diæcia, Order Monodelphia of the Linnæan System. It would be superfluous to enter into a minute description of a plant already so well described, particularly by Roxburgh: I shall therefore merely notice some peculiarities that deserve attention. The tree, like many of its class, has a strong tendency to become Monæcias, and planters in general are rather well pleased at this habit, thinking they secure a double advantage by having the male and female flowers on the same plant. This however is delusive, and being against the order of nature, the produce of such trees is invariably inferior, showing itself in the production of double nuts and other deformities. It is best, therefore, to have only female trees with a due proportion of males. But few have the moral resolution to cut down the Monæcias tree, on the principle that something is better than nothing, but they forget that the Monæcias plants having much fewer flowers, it will take three or four of them to yield the same amount of pollen as the true male, and as for the produce yielded by such trees, that of one good female is worth a dozen of the other.

The female flowers, which are merely composed of a trifid calyx and no corolla, when produced by a tree in full vigor, are perfectly urceolate, slightly tinged with green at the base, and well filled by the ovary, whereas the female flowers of weakly trees are entirely yellow, imperfectly urceolate, and approach more to the staminiferous flowers of the male.

The shape of the fruit varies considerably, being spherical, oblong, and egg-shaped, but "cæteris paribus" the nearer they approach sphericity of figure the more highly are they prized.

There is also a great variety in the foliage of different trees, from elliptic, oblong and ovate, to almost purely lanceolate shaped leaves. This difference seems to indicate in some measure the character of the produce, trees with large oblong leaves appearing to have the largest and most spherical fruit, and therewith small lanceolate leaves being in general more prolific bearers, but of inferior quality.

The object of this paper being practical, I shall confine myself as much as possible to a record of an experience extended over a period of some 20 years; and as the subject of spice planting has now become one of deep interest to very many of the Straits' settlers, I entertain a hope of being able to offer some useful hints to those already engaged in such operations, and a tolerably safe guide for future speculators. But I am by no means disposed to think that I can so exhaust the subject as leave nothing for future writers, being fully persuaded in my own mind, that the cultivation of the nutmeg can still be greatly improved, and that in fact very little science has as yet been expended upon it.

The nutmeg planter, to use Colonel Low's expressive words, "must have the bump of perseverance myristicatically developed, and be impervious to compunctious feelings or opening his purse"; the combination also of an enthusiastic temperament with untiring patience is desirable. If he be in haste to get rich, let him attend to some other pursuit; but he has this consolation, that nutmeg planting properly conducted, although slow, is sure, and when brought to a certain point, safe and enduring; and he has the further consolation of knowing that nature has bestowed upon him a monopoly, for the nutmeg tree appears to be confined within comparatively narrow limits. Whilst its congener, the clove, has been spread over Asia, Africa, and West Indies, the nutmeg refuses to flourish out of the Malayan Archipelago except as an exotic, all attempts, hitherto made to introduce it largely into other tropical countries, having decidedly failed.

The Island of Ternate, which is in about the same latitude as Singapore, is said to have been the spot where it was truly indigenous, but no doubt the tree is to be found on most of the Moluccas. At present the place of its origin is unproductive of the spice, having been robbed of its rich heritage by the policy of the Dutch, who at an early period removed the plantations to the Banda Isles, for better surveillance, where they still remain and flourish. But although care was formerly taken to extirpate the tree on the Moluccas, the mace-feeding pigeons have frustrated the machinations of man, and spread it widely through the Archipelago of islands extending from the Moluccas to New Guinea. Its circle of growth extends westward as far as Penang, where, although an exotic, it has been cultivated as a mercantile speculation for many years with success, so much so, that doubtless the Penang planters think themselves more in a situation to give than receive advice. I shall therefore beg any of those magnates who may chance to cast an eye on this paper, to bear in mind that what they read is more peculiarly applicable to Singapore than any other locality, and that moreover, the plans laid down have succeeded here. Westward of Penang, there are no plantations, looking at the subject in a mercantile point of view. The tree is to be found, indeed, in Ceylon and the West Coast of India, but to grow it as a speculation out of its indigenous limits, is as likely to prove successful as the cultivation of apples and pears in Bengal.

In the Banda Isles, where the tree may be considered as indigenous, no farther attention is paid to its cultivation than setting out the plants in parks under the shade of large forest trees with horizontal branches, called "Canari" by the natives. Here it attains a height of fifty feet and upwards, whereas from 20 to 30 feet may be taken as a fair average of Straits trees; but notwithstanding our pigmy proportions, it does not appear from all I could ever learn, that we are relatively behind the Banda trees either in quantity or quality of produce, and I am strongly impressed with the idea that the island of Singapore can compete with the Banda group on perfectly even terms. Our climate is quite unexceptionable for the growth of the nutmeg, being neither exposed to droughts or high winds; and although we may lose by comparison of soils, we again gain by greater facilities of sending our produce to market, by the ability of obtaining abundant supplies of manure, and any amount of free and cheap labor.

I shall now endeavour to lead the planter step by step on his weary way, but just to cheer him a little, he may have the assurance that a nutmeg plantation well laid out and brought up to perfection, is one of the most pleasing and agreeable properties that can be possessed. Yielding returns more or less daily throughout the year, there is unceasing interest, besides the usual stimulus to all agriculturists of a crop time, when his produce increases to double and quadruple the ordinary routine.

Trees having arrived at 15 years growth, there is no incertitude or fear of total failure of crop, only in relative amount of produce, and this, as will be seen, is greatly in the planter's own power to command. It is against reason to suppose that a tree always in flower and fruit will not expend itself if left to unaided nature; it must be supplied with suitable stimuli to make good the waste; therefore he who wants nuts must not be sparing of manure,.but of this more directly.

The first requisite for the planter is choice of location. It is true that the nutmeg tree, aided by manure, will grow in almost any soil where water does not lodge, but it makes a vast difference in the degree of success, whether the soil be originally good, or poor and improved by art. The tree thrives not in white or sandy soils, but loveth the deep, red, and friable soils formed by the decomposition of granite rocks and tinged with iron, and the deeper this tinge the better. I am therefore inclined to think, that iron in the soil is almost necessary for the full development of the plant. If under the before-mentioned soil there be a rubble of iron-stone at 4 or 5 feet from the surface (a very common formation in Singapore), forming a natural drainage, the planter has obtained all that he can desire in the ground, and needs only patience and perseverance to secure success. The form of the ground ought to be undulating, to permit the running off of all superfluous water, as there is no one thing more injurious to the plant than water lodging around its roots, although in order to thrive well it requires an atmosphere of the most humid sort and rain almost daily. Besides the form of the ground, situation is highly desirable, particularly as regards exposure. A spot selected for a nutmeg plantation cannot be too well sheltered, as high winds are most destructive to the tree, independently of the loss occasioned by the blowing off of fruit and flower.

At present there is abundant choice of land in Singapore, the greater portion of the island being as yet uncultivated, and much answering to the above description. The land can be purchased from Government at the rate of from 5 to 10 Rupees per acre in perpetuity. I would advise the man who wishes to institute a plantation to select the virgin forest, and of all things let him avoid deserted gambier plantations, the soil of which is completely exhausted, the Chinese taking good care never to leave a spot until they have taken all they can out of it. A cleared spot has great attraction for the inexperienced, and it is not easy to convince a man that it is less expensive to attack the primitive forest, than to attempt to clear an old gambier plantation overrun with the *láláng* grass; but the cutting down and burning of large forest trees is far less expensive than the extirpation of the *láláng*, and as the Chinese leave all the stumps of the large trees in the ground, it is also more difficult to remove them in this state than when you have the powerful lever of the trunk to aid you in tearing up their roots, setting aside the paramount advantage that in the one case you possess a fresh and fertile soil, in the other an effete and barren one, for if there be any one plant more than another capable of impoverishing and wearing out land, it is the gambier plant.

Forest land, or jungle as we call it in these parts, can be cleared for about from 25 to 30 dollars per acre by contract, but the planter had better be careful to have every stump and root of tree removed, ere he ventures to commence planting, or the white-ants, attracted by the dead wood, will crowd into the land, and having consumed the food thus prepared for them, will not be slow in attacking the young trees. Whilst the planter is thus clearing the ground, he may advantageously at the same time be establishing nurseries:—for these the ground ought to be well trenched and mixed with a small quantity of thoroughly decomposed manure and burned earth, making up the earth afterwards into beds of about 3 feet wide with paths between them, for the convenience of weeding and cleaning the young plants. Of course, if the planter can obtain really good plants the produce of well selected seed, it will be a great saving of time and expence to him, but unless the seed be carefully chosen, I would prefer beginning my own nurseries, and in the selection of seed would recommend the most perfectly ripe and spherical nuts. Oval long nuts are to be rejected, particularly any of a pale color at one end. Few things tend more to ultimate success than good seed, therefore too much attention cannot be bestowed upon it. I am of opinion, that planters have been hitherto very careless on this subject, hence we see such varieties of the tree, which is becoming every day what the gardeners in England call more sportive; this also partly arises from continuing to reproduce plants from those of the place, whereas were the planters of Penang and Singapore to interchange their seed, it would be mutually profitable. We know that the agriculturists of Europe find it to their advantage to obtain seed for their cereal crops from places remote, and even the inhabitants of the British Isles find it necessary to make such interchanges. It is not easy to afford a reason for this, but the fact is well established, and would appear to be the fiat of infinite wisdom for some great good, perhaps to induce indolent and selfish man by the strong stimulus of self-interest to a mutual reciprocity and kindness of feeling, by demonstrating to him in so practical a manner that his own good is linked inseparably with that of his neighbour.

The planter having selected his seed, which ought to be put in the ground within 24 hours of being gathered, setting it about 2 inches deep in the beds already prepared, and at the distance of from 12 to 18 inches apart, the whole nursery ought to be well shaded both on top and sides, the earth kept moist and clear of weeds, and well smoked by burning wet grass or weeds in it once a week, to drive away a very small moth-like insect that is apt to infest young plants, laying its eggs on the leaf, when they become covered with yellow spots, and perish if not attended to speedily. Washing the leaves with a decoction of the Tuba root is the best remedy I know of, but where only a few plants are affected, if the spots be numerous, I would prefer to pluck up the plant altogether rather than run the risk of the insect becoming more numerous, to the total destruction of the nursery. The nuts germinate in from a month to six weeks and even later, and for many months after germination the seed is attached to the young plant, and may be removed apparently as sound as when planted, to the astonishment of the unlearned, who are not aware of the great disproportion in size between the ovule and albumen, the former of which is alone necessary to form the plant. The plants may be kept in nursery with advantage for nearly two years. Should they grow rapidly and the interspaces become too small for them, every second plant had better be removed to a fresh nursery and set out at a distance of a couple of feet from each other. When transplanted either in this way, or for their ultimate position in the plantation, care should be taken to remove them with a good ball of earth, secured by the skin of the plantain, which prevents the ball of earth falling to pieces.

The nurseries being established, the ground cleared and ready, the next proceeding is to lay out and dig holes about 26 or 30 feet apart, and as the quincunx order has many advantages, it is the form I would recommend for adoption. The holes should be at least 6 feet in diameter and about 4 feet deep, and when refilled the surface soil is to be used and not that which is taken out of the hole. Each hole should be filled up about one foot higher than the surrounding ground, to allow for the settling of the soil and sinking of the tree, which planted even at this height, will, in a few years, be found below the level. Over each hole thus filled up, a shed, closed on two sides east and west, and proportioned to the size of the plant, is to be erected. The best substance for this purpose is, I think, the Attap ;—*láláng* grass and bamboo, occasionally used, have their disadvantages, the former attracts white-ants, the latter when commencing to decay, breeds a black blight that is soon transferred to the plant, injuring it most materially. It is not a bad plan to leave an open space in the centre of the top of each shed about 12 inches wide, by which the young plant can obtain the benefit of the dew and gentle rains, which more than compensates for the few rays of sun that can only fall upon it whilst that body is vertical. After the sheds have been completed, each hole should have added to it a couple of baskets of well decomposed manure, and an equal quantity of burned earth, when all is ready for the reception of the plant, which, having been set out, if the weather be dry, will require watering for 10 days or a fortnight after, in fact until it takes the soil. As I have mentioned burned earth both for the use of the nursery as well as final transplanting, I may as well here explain what I mean by that substance : this earth when well prepared is quite black, friable and pungent of smell, containing potass and abundant small portions of charcoal. It is eminently useful in all kinds of cultivation, rendering friable the stiff clay and affording carbonic acid to the plants. The Chinese with good reason place much dependence upon it as a manure, and most of them know very well how to make it, but unfortunately it cannot be made in every locality, as it requires a very large quantity of firewood to prepare it properly, and is only really good when made of the peaty substance that forms the top surface of all the bottoms between the hills that spread over nearly the whole island of Singapore. This manure may be useless from two causes, either if overburned, when it turns red and is effete, or if not sufficiently burned, when it will be filled with chips and portions of unburned wood, and become a source of attraction to the white-ants, by no means desirable visitants. The earth so soon as prepared ought to be placed under sheds until required for use, otherwise it loses much of its stimulating properties, particularly if exposed to heavy rains.

The planter having set out all his trees must not deem his labors completed, they are only commencing. To arrive thus far is simple and easy, but to patiently watch and tend the trees for ten years after, requires all the enthusiasm already mentioned. About three months after planting out, the young trees will receive great benefit if a small quantity of liquid fish-manure be given them. In the first six years they ought to be trenched round three times, enlarging the circle each time, the trenches being dug close to the extremities of the roots which generally correspond to the ends of the branches, and each new trench commencing where the old one terminated, they must of course greatly increase in size as the circle extends, requiring a proportionate quantity of manure, but the depth ought never to be less than two feet. The object in trenching is to loosen the soil and permit the roots to spread, otherwise the tree spindles instead of becoming broad and umbrageous. This operation might with much benefit be performed ere the roots arrive at the outer rim of the already prepared soil, instead of the usual plan of waiting until they penetrate the unloosened earth, by which many of the roots are necessarily obliged to be cut, and the tree thereby checked for some months. The present plan of manuring has invariably this effect, and might be altered with decided advantage, for it can never benefit a tree to cut and destroy the extremities of the roots by which it is mainly supported. Were the trenches therefore made in an advance of the roots it would be a very great improvement in the cultivation. As the trenches are now dug for the purpose of manuring, the usual mode is to throw into the bottom of the trench all the grass that can be collected, covered by a layer of earth, filling up the remainder with manure and earth well mixed, part of which ought to be used for top dressing, having previously scraped away the surface soil so as just to expose the extremities of the roots. In time the circles extending, will at last meet, and the whole of the ground having been by that time gone over, the trees ought to completely cover the ground, and top dressing will then suffice. This latter would at all times be the most economical mode of manuring, and might be given after every heavy crop, but as I before mentioned, it is essentially necessary to loosen the whole of the ground, or the thick fibrous root of the nutmeg cannot pierce through, and the plant will be stunted. Some persons apply their manure fresh from the stable or cow yard. There is no question that fresh manure enriches ground more than that which has undergone perfect decomposition, but unfortunately fresh manure when brought into contact with the roots of the tree destroys them, the ends blacken and decay, and in this state, if there be white-ants in the ground, they very soon attack and kill it altogether. Manure is beyond all other considerations the most important to the welfare of an estate; it is that which gives quantity and quality of produce, and without it a plantation cannot be carried on. The want of it must limit the cultivation in the Straits, and will yet bring up many a planter, who, having got his plantation to look well up to the eighth year with very little manure, thinks he can go on in the same manner. But trees grows readily up to the 7th or 8th year;—it is then that really good cultivation begins to tell, and, even with the best care, trees receive a check upon their first showing fruit, but the skilful planter about this period will redouble all his energies, knowing that he is near to his reward, and will lose it entirely if he omits to do so. The nutmeg tree likes well all sorts of manures, but that which is best for it seems to be the well rotted stable and cow yard manure, mixed with vegetable matter, and when the tree is in bearing the outer covering of the nut itself is about one of the very best things to be thrown into the dung pit. Dead animals buried not too near the roots are very acceptable to the trees, also blood, fish, and the oil-cake imported from Java, but the greatly lauded manure of the present day, Gauno, I decidedly object to. Having tried several tons of it I am of opinion, that it is the least beneficial substance that can be given to the nutmeg tree. It certainly causes the tree to assume a deeper tint of foliage, and at first to throw out young shoots, but there seems to come a very unpleasant reaction afterwards, and I am inclined to think, the quality of the produce is deteriorated; at least such is my conviction on the subject that I shall never try it as manure again. With respect to the best mode of preparing and keeping manure I am disposed to the plan of placing it in pits, although in Europe stacking it in heaps is, I believe, generally preferred, but our climate here is so desicating that manure thus exposed will lose too much of its moisture to ferment properly, and the loss will also be much greater. Besides if it be not required for immediate use, it keeps much better in a pit covered over by a coating of earth to prevent evaporation. When required for use it ought neither to be too dry nor wet, the best state is that of an homogeneous black paste. Equal parts of this substance and burned earth, such as already described, is the stuff to produce nutmegs, and he that uses most will get most. Slovenly cultivation is the most expensive in the end, and by far the least satisfactory.

But although manuring is the chiefest element in successful cultivation there are many other matters for the planter to attend to during the period that his trees are growing. All bad grasses must be carefully kept out of the plantation, at least from between the trees, and the harmless grasses rather encouraged, as they keep the surface cool. I have seen the reflected rays of the sun from an uncovered whitish soil, regularly scorch up the leaves, although the plant was covered over on two sides, and the top by the usual artificial shade. The trunk of the tree ought to be carefully washed with soap and water once a year to keep it clear of moss, this has been ridiculed as being a work of supererogation;—let those who think so, omit the operation. Parasitical plants of the genus *Loranthus* are very apt to attach themselves to the branches, and if not removed do great injury, in fact, if altogether unattended to, they will in time destroy the tree. The enemies of the nutmeg tree are fortunately not numerous, but they have a few; white-ants among the number. I know of no remedy for these but cleanly and good cultivation: they seldom if ever attack a vigorous plant; it is upon the first symptoms of decay that they commence their depredations,—their nests may surround a tree and their small tunnels pierce the earth in every direction about its roots without the plant giving any indications of decay, but whenever I have discovered them in such localities I have always endeavoured and often successfully, to dislodge them by a dose of a solution of pig dung, an article apparently not at all to their taste, although fresh cow dung is a strong source of attraction, another reason to those I have already given for using this latter substance in a perfectly decomposed state when it can be well mixed up with the soil, and appears no longer to have an attraction for those destructive insects, which cannot be too jealously watched, for when once they attack a tree the case is hopeless. The first notice a planter has is the withering of the leaves, and when he comes to examine he generally finds it necessary to dig up and uproot the plant at once, rather than leave it as a nidus for those voracious depredators; every planter must lay his account to losing occasional trees by them, but he who has his ground clearest and most free of old roots and stumps of trees will lose fewest. There are several species of insects which lay their eggs on the leaves but they are not all of equal importance; that which manifests itself by the discolorization of the leaf, and the larvæ of which are embedded in the substance and not on the surface, appears the worst, but all ought to be carefully watched and removed or they rapidly spread and cause great havoc amongst the trees. For this purpose it is necessary to wash the leaves with a decoction of Tuba root, and syringe them by means of a bamboo with chunam and water of the consistence of white-wash, this adheres to the leaves, and will remain even after several heavy showers, giving for the time rather an unsightly appearance to the tree, but making amends by clearing it of the larvæ already alluded to; another nuisance is the nest of the large red ant; these collect and glue the leaves together, forming a cavity for the deposition of their larvæ. All leaves thus made use of turn yellow and die; they do not, that I have observed, otherwise injure the tree, but trees so infested do not bear well, and the ants bite the collectors severely, and indeed any person incautious enough to brush against the tree. The best mode of destroying them is to hang a portion of some animal substance, such as the entrails of a fowl or the like, to the end of a pole, the opposite extremity of which is allowed to pass through the branches, the ants will run along the pole and collect in immense quantities around the bait, when by a lighted faggot they can be burned by thousands. This operation repeated a couple of times a day for a week or so, will rid the tree of the invaders, their nests should be broken up by the collectors as they go their rounds, but this they are very unwilling to do, seeing that there are few insects more ready to revenge themselves, and the coolies never fail of a good biting whenever they try the experiment of disturbing them. I have now made the planter tolerably well aware of what he has to do and of most of the difficulties he has to encounter, I shall now endeavour to give some notion of the prices of labor and material, and speak of the work best done by contract, and that which one had better perform with the laborers on the estate.

The first operations of clearing ground and digging the holes can be done more cheaply by contract labor than by men on monthly hire, very little supervision in such case being required, as it is easy to see whether the ground be well cleared or not, and the size of holes being determined previously, there can be no dispute about the matter afterwards. It is surprising how much better the Chinese work when they are paid by the task rather than the day, and singular enough, they are better content, working harder and earning less by the former system than the latter. Few laborers in the world can equal them when working on their own account, but on regular wages they are most complete eye-servants: they are however, upon the whole, the best class of field laborers. The usual monthly pay to good strong men is 3 to 3½ Spanish dollars per month, but those who have become expert at any particular work very soon discover their value, and cannot be kept without an increase of wages. Malays are to be had for dollars 2½ per month, and it is well to mix them with the Chinese; in making sheds for trees and all work where the rattan is used, they are more expert, they are also more to be trusted, and are a very wholesome check upon the vagabond sons of Han. Patience and temper are eminently necessary to get on with the Malay; they are not to be driven, but kindness and a little banter occasionally have excellent effect upon them. The Boyans are the most quiet, the most honest, and the most to be trusted of any of the races we see here; they are very slow and not over-bright, but they perform their work as well in the absence of the overseer as before him, and they are by far the best nut gatherers. The Klings, or natives from the coast of Coromandel, are good workers if they choose to exert themselves, but they are the most wretched eye-servants, and seem to delight in chicanery of all sorts; unlike the Malay, fear is the only motive capable of exciting them to action, and the application of the Mundoor's or Superintendent's rattan seems the only argument they understand; they are chiefly valuable in taking care of horses or cattle, cutting grass and driving carts, all other work is better done by Chinese or Malays; their wages is about the same as Chinese laborers, that is, from 3 to 3½ dollars per month.

Manuring, making sheds over young plants, and extirpating bad grasses, are works which had better be performed by the regular monthly laborers on the estate, and indeed so soon as a plantation comes into bearing all contract labor must cease, as by admitting strangers the facilities for robbery would be more than any supervision could frustrate. The number of men to be kept on an estate, to preserve it in first rate order, after it has come into bearing, must depend of course upon the size of the plantation, but in general one man for every 100 trees will be found sufficient, provided there be some 4 to 5 thousand trees. On a small scale the proportion must be greater, as the idlers, such as those who take care of and prepare the spice, gather the nuts, and manage the horses and carts, tell more upon a small than a large scale. A man by planting the Guinea grass and feeding cattle may make his own manure, and I believe it to be the best mode of proceeding; those who depend upon the town for their supplies will frequently meet with disappointment and never obtain such good manure. The price of manure, generally speaking, is about 8 cart loads for the dollar, each cart containing 20 baskets. I conceive that two such carts, with a similar amount of burned earth, to be little enough manure for a tree of 12 years of age. It is almost impossible for a planter to manure the whole of his trees in the same season, if they amount to several thousands: in this case the best plan is to divide the property into sections, manuring them in regular rotation, and to apply a few baskets of manure as top dressing to any particular trees that show symptoms of flagging.

The nutmeg planter is under the necessity of keeping up nurseries throughout the whole of his operations, for the replacement of bad plants and redundant males. Of the latter, ten per cent. seems to be about the best proportion to keep, but I would have completely Diœcious trees. No person can boast to get a plantation completely filled up and in perfect order much sooner than 15 years. Of the first batch planted, not more than one-half will turn out perfect females, for I do not take into account Monœcious trees which I have already condemned. The tree shows flower about the 7th year, but the longer it is before doing so, the better and stronger will it be. I cannot refrain from a smile when a sanguine planter informs me with exultation that he has obtained a nut from a tree only 3 or 4 years planted out,—so much the worse for his chance of success, too great precocity being incompatible with strength and longevity. The best trees do not show flower before the 9th year, and one such is worth a score of the others. This will be evident when it is stated that I have seen several trees yield more than ten thousand nuts each in one year, whereas I do not believe that there is a plantation in the Straits that averages 1000 from every tree. This very great disparity of bearing shows plainly that the cultivation of the plant is not yet thoroughly understood, or greater uniformity would prevail, and I think it clearly enough points out that a higher degree of cultivation would meet its reward. It is not quite safe to cut down the male plants upon first showing flower, as they many times show perfectly female flowers the following year, and in that case are generally the strongest and finest trees. But there is some indication of this in the first mode of flowering. When the racemes are many times divided and have numerous flowers, there is no chance of its becoming entirely female, but where there are only two or three flowers on a raceme there is a fair prospect of its doing so. The tree has not been introduced into the Straits sufficiently long to determine its longevity, but those introduced and planted in the beginning of the present century as yet show no symptoms of decay. The experiment of grafting the trees, which at first view presents so many advantages, both in securing the finest quality of nut and the certainty of the sex, has still to be tried in this cultivation. Some three years ago, I succeeded in grafting several plants by approach, these are not sufficiently old for me to decide whether it be desirable or not, for although the plants are looking well and growing, they as yet have thrown out their branches in a straggling irregular manner, having no leaders, and consequently they cannot throw their branches in the regular verticles necessary for the perfect formation of the tree, without which they must ever be small and stunted, and consequently incapable of yielding any quantity of produce. The grafts have succeeded so far as stock and scion becoming one, and in time a perpendicular shoot from the wood may appear. If after this it should increase in size and strength so as to form a tree of full dimensions, the advantage gained would be worth any trouble, the quality of some nuts being so far above that of others it would make a difference beyond present calculation; in short, 1000 such picked trees at the present prices would yield something equivalent to twenty thousand dollars per annum, for Sp. drs. 20 per tree would be a low estimate for such plants. If this ever does occur it will change the aspect of the cultivation altogether, and I see no good reason why it should not, except that those possessing trees of the quality alluded to, would not very willingly permit others to graft from them, so it is only the already successful planter who can try the experiment properly.

In addition to keeping the trees clean and free from moss and parisitical plants, it is highly desirable to use freely the pruning knife, cutting away all perpendicular shoots, the decayed ends of branches, or whenever the verticles are too close thinning them to admit air and sun to the centre. From over-bearing, poverty of soil, or lodgement of water, it frequently happens that the top of the tree withers, and the whole of the plant will soon follow, unless it be cut down below the affected part; if this be done in time it generally saves the tree, which after a few months will throw a shoot from the hard wood of the stem to replace the former loss. Young plants are all the better for having the two or three first series of verticles cut off, otherwise the tree becomes too shrubby, and the lower branches touch the ground, excluding air, forming altogether a very inferior plant. This practice would however be unsafe in places like Penang affected by droughts, unless the plants be kept well shaded, until the upper verticles are sufficiently large to afford protection to the roots. As the tree bleeds freely upon being cut, the pruner ought to take along with him a pot of cement formed by boiling together two parts of pounded chalk and one of vegetable tar, which applied warm, stops the run of the sap, gradually hardens, and will remain on the cut part until it be quite healed. I have seen it stick on for several years, resisting all weathers.

Some trees from receiving too great a check are apt to overbear, and will soon wear themselves out if not watched and relieved of their superabundant fruit. This ought to be done so soon as the fruit forms, and if permitted to remain until three-fourths grown, the mischief is already effected, and cannot easily be remedied, but even should the tree not perish, the crop will scarcely be worth the gathering, so inferior will be the quality, and the tree unable to perfect its fruit, which splits ere the mace is red, and while the nut is soft and good for nothing. Unhappily some trees have a habit of splitting their fruit untimely, although their general appearance indicates strength and vigor. This is a fault for which as yet I know of no remedy; I attribute it to an original fault in the seed, and if this be correct, I fear it admits of none.

The planter having his tree arrived at the agreeable point of producing has but slight trouble in preparing his produce for market. As the fruit is brought in by the gatherers, the mace is carefully removed, pressed together, and flattened on a board, exposed to the sun for three or four days, it is then dry enough to be put by in the spice house until required for exportation, when it is to be screwed into boxes and becomes the mace of commerce. The nutmeg itself requires more care in its curing, it being necessary to have it well and carefully dried ere the outer black shell be broken. For this purpose the usual practice is to subject it for a couple of months to the smoke of slow fires kept up underneath, whilst the nuts are spread on a grating about eight feet above. I myself prefer one raised fully 10 feet, but the model of a perfect drying-house is easily obtained, and the process is too well known to require any further explanation. The only caution I would give is, that planters ought to take care and not dry their nuts by too great a heat as they shrivel and lose their full and marketable appearance; for this purpose I think it desirable to keep the nuts, when first collected, for eight or ten days out of the drying-house, exposing them at first to an hour or so of morning sun, and increasing the exposure daily until they shake in the shell; the nuts ought never to be cracked until required for exportation, or they will be attacked and destroyed by a small weevil-like insect, the larvæ of which is deposited in the ovule, and, becoming the perfect insect, eats its way out, leaving the nut bored through and through, and worthless as a marketable commodity. Liming the nuts prevents this to a certain extent, but limed nuts are not those best liked in the English market, whereas they are preferred in that state in the United States. When the nuts are to be limed it is simply necessary to have them well rubbed over between the hands with powdered lime. I am given to understand that they are steeped in a mixture of lime and water for several weeks by the Dutch mode of preparation. This no doubt will preserve them, but doubtless it must also have a prejudicial effect on the flavor of the spice. After the nuts are thoroughly dried, which requires from six weeks to two months' smoking, they cannot be too soon sent to market. But it is otherwise with the mace, that commodity when fresh not being in esteem in the London market, seeing that they desire it of a golden color, which it only assumes after a few months, whereas at first when fresh it is blood-red; now red blades are looked upon with suspicion, and are highly injurious to the sale of the article. This is one of those peculiar prejudices of John Bull, which somewhat impugns his wisdom, but must be attended to, as John is ever ready to pay for his caprice; therefore those who provide for him have no right to complain although they may smile.

Through the kindness of the Resident Councillor, I have been furnished with the following correspondence and statistics* which show, that the nutmeg tree was sent from Bencoolen to Singapore the latter end of 1819, so that twenty nine years have elapsed since its first introduction. Some of the plants alluded to in Sir Stamford Raffles' letter were set out at the foot of Government Hill in neither a bad soil nor locality, and several of them are at present and have been for the last ten years fine fruitful trees. Table No. 1 shows that 315 trees in this garden yielded last year 190,426 nuts, or at the average of 604 for each tree, but of the 315 bearing trees mentioned in the table not over fifty are of the old stock, most having been planted since 1836, so that a planter may safely calculate on having a better average than is here set forth, provided he attends to his cultivation and his trees are brought up to the age of 15 years. If a plantation be attended to from the commencement, after the manner I have endeavoured to explain, and the trees be in a good locality, the planter will undoubtedly obtain, an average of 10 lbs. of spice from each tree from the 15th year. This at an average price of 2s. 6d. per lb. is 25 shillings per annum. He can have about 70 such trees in an acre, so that there is scarcely any better or more remunerative cultivation when once established, but the race is a long one, the chances of life, a high rate of interest in this country make it one of no ordinary risk, and it is one that holds out no prospect of any return in less than 10 years. A person commencing and stopping short of the bearing point either by death or want of funds will suffer almost total loss, for the value of such a property brought into a market where there are no buyers must be merely nominal. Again, if the property has arrived at the paying point, almost any person of common honesty can take charge of and carry it on, for the trees after 12 years are remarkably hardy and bear a deal of ill treatment and neglect ; not that I would recommend any person to try the experiment, but it is some consolation for the proprietor to know that stupidity will not ruin him, and that even at the distance of thousands of miles he can give such directions as, if attended to, will keep his estate in a flourishing and fruitful state.

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* We have not thought it necessary to reprint these.—Eds. *Journal A. and H. S.*

I have now set the pros and cons of nutmeg cultivation before the reader. Should he like to try the experiment there is ample scope and verge enough for him in Singapore. He need not be afraid of failure if he proceeds with energy and perseverance. The cultivation is rapidly extending, and I fear the prices are falling. Should the Moluccas be thrown open, I cannot answer for how much greater may be the depreciation in value, but a produce that requires 15 years to bring it to market in remunerative abundance is not so easily overdone. The tree is not more quickly productive in the island of Banda than in the Straits, and, as I have before said, neither do they excel us in relative quantity or quality. Those who have established plantations may laugh at the bugbear of over-production, and rest content even with some further reduction in prices.

The consumption is increasing and likely to increase in the United States, and no doubt, were the heavy duty exacted in England lightened, the consumption would also increase in Great Britain. At present the duty is above the value of the article, which is any thing but encouragement to our eastern colonies, and is hardly fair, considering that the differential duties have been done away with, and that we have to compete on equal terms with our monopolizing neighbours the Dutch, who take very good care to make no reciprocation in favor of British commerce.—*Journal of the Indian Archipelago, for October*, 1848.

NEMOPHILA MACULATA.

NEMOPHILA MACULATA, *Bentham* (spotted-flowered Nemophila).—Hydrophyllaceæ.

This is said to be the best of the annual plants collected by Mr. Hartweg, during his recent mission to California in search of new plants for the Horticultural Society. Mr. Hartweg gave it the name of *N. speciosa*, a title which has been rejected on account of its "inappropriateness," and Mr. Bentham has given it that which stands at the head of this article, but which is not, by the way, a very distinctive one, inasmuch as one of the commonly cultivated species *N. atomaria* has its flowers spotted all over with little dark-colored dots.

Nemophila maculata is an annual plant, of a procumbent habit, like that of the well-known *N. insignis*, and the whole plant is clothed with short spreading hairs. The lower leaves are lyrately-pinnatifid, the lobes being short, obtuse, and somewhat falcate, and the upper ones wedge-shaped and three-lobed. The flowers grow from the axils singly, on stalks longer than the leaves, and are about the size of those of the large variety of *N. insignis*, whitish in their ground color, and each lobe of the corolla tipped with a large deep-violet botch, which, when perfect, gives the flower a showy and rather peculiar appearance. This plant attains about the same size as does its congener just mentioned, and produces its blossoms freely, so that it will prove both useful and ornamental under cultivation.

There is one circumstance which has been observed respecting it, that may be regarded as an objection; the colors are liable to sport and vary. Sometimes the flowers are veined, the veins being of a pale blue color, thus spoiling their purity; at other times the spots are ill-defined, pale, and even sometimes run, by which the flowers lose their distinctness. To retain the species, therefore, in its beauty, the seeds must be saved from the more perfect only of the blossoms, or those in which the colors are pure and distinct; and from among these, those with indistinct, pale, or run colors, should, as far as possible, be removed as soon as they show themselves. It is the clear and deep-colored, well-defined spotting which gives to the true kinds its beauty; the indistinctly marked plants being in every way inferior.

No difficulty occurs in its cultivation, which should be made to accord with that of the other species, which are by this time familiar objects in most gardens. As an annual it will rank in the hardy class, growing well in any good garden soil, and perfecting seeds by which it may be continued from year to year. These seeds may be sown either in the open border, at different periods for a succession of blooming plants, or the earlier plants may be reared in pots or boxes in a frame, and transplanted into the open ground in April or May. Whether it would survive the winter if sown in the autumn, as *N. insignis* does in dry warm situations, we have had no opportunity of knowing; but coming from the same country, California, the probability is that it would, and if so, a portion should be sown in this way for blooming early in the spring.

Though an interesting, and when perfectly true, a pretty plant, it is by no means so ornamental or effective as *N. insignis*, owing to the absence of distinctive coloring, which in the latter species, apart from its other beauties, renders it a particular and universal favorite.—*Horticultural Magazine, for December*, 1848.

Correspondence and Selections.

COTTON CULTURE AT OMEGHUR, NEAR AGRA: AN IMPROVED MACHINE FOR DIVESTING THE WOOL FROM THE SEED.

Extract of a letter from H. HAMILTON BELL, ESQ., *dated from Omeghur, near Agra, October 29th,* 1847.

The Government of the N. W. Provinces is taking a very warm interest in the cotton question, and cordially exerting itself to render this country the source of supply of an article forming the raw material of our greatest home manufacture. The very imperfect condition in which cotton is brought to market is almost as objectionable as its inferior quality, and the improvement of the latter is scarcely more necessary than to render the article fairly merchantable.

Whilst providing from all parts of the country the seed of cottons of high repute in the native markets, and which have been approved in England, and endeavouring to substitute these for the very inferior qualities grown in the Doab, the difficulty of preparation suitably for the home market still remains, and engages the attention of Government, who have been pleased to entrust to me the management of the cotton experiment now in progress. To attain the latter object, the only plan appears to me to be to take the *kupas*, or unseeded cotton, from the *Kisans;* but this necessitates machinery for freeing it from the seed, the native *churka* being very imperfect, and of little capability; whilst picking by the hand is tedious and expensive. The American saw-gin has now been a failure, and we must seek other resources.

Mr. J. H. Mather, who has made some improvements on a *churka* of the late Mr. Potter, the experiments on which, before a committee appointed by Government to report on the improved machine, have led to his being deputed to Calcutta to make up a sufficient number for the application of other motive power than manual labor, will probably call at the Society's rooms to inspect any machinery that may there be met with, and may seem likely to answer either of the objects in view; and I venture to recommend this gentleman, who is, I believe, of considerable scientific acquirements, to your obliging attention in the enquiries he may be solicitous to make. I mention Mr. Mather's name at his desire, but I am quite satisfied nothing of the kind is required to insure your assistance in any matter of such great public interest as the business in which he is engaged.

REPORT ON THE PRESENT STATE OF THE PUBLIC GARDEN AT LUCKNOW. COMMUNICATED BY CAPT. G. E. HOLLINGS.

I have the pleasure to enclose a list of the prizes given at the show of fruits, flowers, and vegetables, held at the Residency Banquetting Rooms this day, which, judging from the opinions of those who kindly attended, afforded great satisfaction, and I have now reason to suppose, that we have really attained some of the objects contemplated when the public garden was originally established, and that hereafter our success will equal our most sanguine expectations. The accompanying statement of our expenses, and the means by which the garden has been maintained, without requiring extraneous assistance of any kind, will prove that I have succeeded in showing that it can support itself; and it is but reasonable to suppose that its resources will rapidly increase, because, notwithstanding a considerable failure in the more valuable fruits, the sale of which afforded the principal source of income, and some heavy expenses resulting from the effects of the severe storm in September 1846, the amount realized by the sale of products in 1847, exceeds that of either of the two preceding years by more than three hundred rupees, whilst the sum drawn from the treasury does not exceed the amount regularly contributed by the King of Oude, the yearly subscriptions of our subscribers, and the interest of the money vested in public securities. The balance sheet shows an available surplus of more than five hundred rupees. I have therefore the pleasing satisfaction of knowing that, notwithstanding the many disadvantages under which I have labored, I have been an useful instrument in promoting a great public cause, by showing, that those who are so inclined, may contribute to the development of the riches contained in the soil, without involving themselves in any extraordinary expense, and whilst they are themselves engaged in a most delightful and interesting pursuit, may contribute to the comfort, happiness, and prosperity of those around them.

I am much in arrears in acknowledging the receipt of different parcels containing seeds, which you were good enough to send, but I am convinced that you will not attribute it to a feeling of indifference. I will however, endeavour to make up for the deficiency, by communicating the degree of success that has attended my efforts to cultivate them here.

The enclosed statement will show what has been done. It was submitted to the subscribers to the Agri-Horticultural Society at Lucknow, with the accounts made up to the 31st December, 1847.

I trust that your kind friend, who sent me a supply of silk-worms' eggs last year, will repeat his favor, for although to all appearance the ones I saved are in good order, I should like to have a large supply from Bengal. I have had a reeling machine constructed from the drawing of the one used at Lyons, in Ure's Dictionary of the Arts, which promises to answer remarkably well; and I feel convinced, that if in other respects the experiment succeeds, there will be no fault found with the reeling this year. I am having a machine constructed for cleaning cotton, which will, I hope, be an improvement on that at present in use, and with the assistance of the excellent workmen employed as carpenters at the Residency, I do not despair of succeeding in having an efficient *churka* made up. I have tried a simple arrangement for a churn, which, if successful, will prove very useful to the natives.

I was greatly disappointed at finding that the Governor General could not pay a visit to our garden during his stay at Lucknow, because, if he had shown the slightest interest in our experiments, it would have convinced the native society, that our labors were usefully directed and appreciated by the Government.

It is gratifying to know that public gardens are being established in all the principal zillahs in the Upper Provinces, under the auspices of the Magistrates, and it always affords me the greatest pleasure to be able to afford any assistance that may be in my power. I regret to say that none of the acorns you so kindly sent to me, and which were presented to the Society by Mr. F. W. Russell, have germinated. The few seeds of black rye* which you sent to me in a letter are prospering, and I can say the same, with one exception, of the small supply of grains you first sent: the last supply of grains from the Court of Directors will not, I am afraid, succeed so well as could be wished, it did not reach me till nearly a month after our rubbee crops had been sown, and were well above the ground.

P. S.—The despatch of my letter having been unavoidably delayed, I have an opportunity of mentioning that I have succeeded in raising in a forcing frame a well flavored melon from the Egyptian seed; and that the first of the silk-worms broke through the egg this morning.

To the Subscribers to the Agricultural and Horticultural Society, Lucknow.

Dear Gentlemen,—Being desirous that you should be acquainted with the state of the pecuniary prospects of the Char Bagh, I have the pleasure to submit for your examination and consideration the accounts from the 1st January 1845 to the present date.† You will, I trust, find the following points established.

1st. That the garden, with the assistance derived from His Majesty, the interest of Company's Paper, and contributions of subscribers, has maintained itself.

2nd. That on the 1st December 1847, there were different sums due to the garden, amounting in the aggregate to Rs. 738-4-10, whilst the liabilities included in the balance due by the garden in the monthly account for December were only Rs. 210-15-2¾, showing a surplus of Rs. 527-5-7¼ in favor of the garden: it is therefore clear, that since I have had charge of the Char Bagh, its permanent funds have not been in any way reduced. You can all say if there is any improvement in the system of agriculture, and the quality and value of the products, and whether affairs are managed generally as they ought to be. You will not fail to remark, that there is an average decrease of more than fifty rupees a month in the expenditure, whilst in comparison with 1845 and 1846, the amount realized by the sale of products has much increased, which could hardly have been expected after the failure during the last season of fruits, from which the principal part of the income of the garden has hitherto been derived.

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* These are the seeds that were sent from England by Mr. Lautour, and are alluded to in the proceedings for October, page 44.—Eds.

† It is considered unnecessary to publish the monthly details, as the yearly abstract, also furnished by Capt. Hollings, gives a clear insight of the disbursements for the garden, and the amount received by sale of produce.—Eds.

As I have managed to overcome all difficulties, and to make some progress towards the attainment of the object contemplated in the establishment of a public garden, namely, the cultivation in the first instance within the garden of new kinds of products, and their eventual dissemination throughout Oude, it is not unreasonable to suppose that in future the income will regularly exceed the expenditure, and if it should be considered desirable, a small sum could be added annually to the permanent funds of the society, until the amount originally subscribed was vested in Government Securities.

Of the new products that have been introduced since the commencement of 1845, I should like you to examine,—when you are inclined to visit the garden,—the plantations of the silk-worm mulberry, the *Morus multicaulis ;* the Dividivi or American *Sumach* used in tanning; the different varieties of sugar-cane, the American and Lahore cotton plants, Madras and Dacca plantains, leechee and other fruit trees received from Calcutta, various kinds of yams and potatoes, and the splendid assortment of flowering shrubs sent to us from Calcutta by the Secretary of the Agricultural and Horticultural Society and Dr. Wallich, and by Major Napleton from Bhaugulpoor. You will also find an excellent specimen of the *Ipomea,* grown from some seeds forwarded to me by Mr. Hume.

The forest trees originally planted in the garden, amongst which are the teak, toon, sissoo and mahogany, are all thriving. Due attention is paid to the cultivation of vegetables, as you may have observed from the specimens, especially those of celery, carrots, beet-root, and endive, exhibited at the show this morning, produced from English, American, and Cape seeds, sent to me by the Society in Calcutta, or received direct by me by the overland route from Messrs. Carter and Co. The collection of flowers is far more extensive than has, I believe, ever been made in Upper India, including varieties of geraniums from Major Napleton and Captain Kirk's garden at Mussooree. Amongst the fruit trees, there are not only several new plantations of seedling and graft mangoes, an extensive increase to the number of loquats, peaches, *alloobokhara,* vines, custard apples, pomegranates, oranges, limes, &c. &c. &c. varieties of guavas and tamarinds, large beds of strawberries, and new kinds of plantains, but a considerable number of new grafts of every kind, some of which I hope will produce excellent fruits: the ones from which I anticipate the most advantage are the orange on the pomegranate; the *alloo-chin* (small plum,) on the *alloobokhara* and peach; the apple on the *buyere;* the nectarine and China peach on the *alloobokhara;* the pear on the guava, and the strawberry-guava on the common guava. I purpose trying experiments in grafting vines on each other, and the red, or what is generally known as the West Indian tamarind, on the common one. I have tried mulberries of different kinds, but have not yet seen the result.

In my own garden I can show you successful attempts at obtaining flower plants from cuttings of the *ipomea, dahlia,* different kinds of *verbena, geraniums, carnations, double pinks, heliotrope,* &c. &c.; and in the Char Bagh you can see how extensively the varieties of the passion-flower—purple, pink, white, and deep-red—have been propagated, as also different kinds of perennial creepers from the Cape, Hills, &c. &c. &c.

I have to attract your attention to the cultivation of the cereal grains, as I feel confident that you will not see finer crops of wheat, barley, oats, and gram than in your public garden, and I trust that although some of the seeds received by the Society in Calcutta from the Hon'ble Court of Directors, and forwarded to me, reached this rather late for the proper season of sowing, we shall be able to obtain a sufficient quantity of seed for general distribution next year.

I confidently hope, that you will be pleased and satisfied with my endeavours to carry out the objects for the attainment of which the garden was given to us by His Majesty the King of Oude, and it is gratifying to me to be able to inform you, that all the plants that have been sent from this to different stations, have reached their destination in excellent order.

In conclusion, I venture to recommend, that as no portion of the rewards given at the different shows have for sometime been taken from the funds of the garden, they should, in future, be left to the management of those who so liberally contribute to them. I will, if you wish, circulate a proposal for subscriptions for the whole year, and when the amount to be given is ascertained, I will ask the contributors to fix on the dates on which the exhibitions are to take place, and the articles for the best specimens of which prizes are to be given. A committee appointed by the subscribers will be easily able to fix the amount of the different rewards.

G. E. Hollings, *Captain,*
31*st December,* 1847. *Manager of the L. A. H. S.*

Abstract.	1845.			1846.			1847.		
Drawn from the Treasury, &c.	2,445	2	10	2,352	10	9	1,552	0	0
Sale of Produce, ...	2,137	10	2½	2,133	5	11½	2,459	1	7½
Amount received from cultivators, ...	460	0	0	311	9	0	307	4	0
Total, ...	5,042	13	0½	4,797	9	8½	4,318	5	7½
Amount expended, ...	5,166	15	9¼	4,756	12	1½	4,198	2	3½
Average monthly sale of products, ...	178	2	2¼	177	9	11¾	204	14	9½
Average monthly expenses,..	430	9	3¾	396	6	4	349	13	6¼

The purchase of cattle, buildings, repairs of wells, compound walls, and preparing wells, &c. are included under the head of sundry expenses.

Sundry expenses, 1845,	901	6	9
Ditto ditto, 1846, ...	363	14	0
Ditto ditto, 1847, ...	429	10	4
Total, Rs.	1,694	15	1

[As the detailed list submitted by Capt. Hollings would occupy more space than can be conveniently spared, it may suffice to mention that the amount of prizes awarded for vegetables, fruits and flowers, aggregated Rs. 125-8.

In the vegetable department prizes to the extent of Rs. 66-8 were given for best specimens of cauliflower, brocoli, cabbage, nole-kole, peas, beans, potatoes, artichokes, turnips, carrots, beet, radish, yams, tomatoes, onions, leeks, spinach, squash, celery, lettuce, asparagus, endive, parsley, salsafy, chilly, capsicum, &c. In the fruit department, to the amount of Rs. 16-8, for citron, pumplenose, orange, sweet-lime, lemon, plantains, &c.

In the list of flowers were, violets, geraniums, heartsease, larkspur, sweet-william, wall-flower, lupins, zinnias, pinks, sweet-peas, narcissus, stock, dahlias, portulacas, candytuft, ipomæas, verbenas, euphorbias, carnation, mignionette, fuschia, honeysuckle, creepers of sorts: for these, prizes amounting to Rs. 42-8 were awarded.

The gardeners of Col. Richmond, Major Scott, Col. Wilcox, Capt. Hollings, Dr. Login, Lieut. Bird, Capt. Lamb, and a few others, were the successful candidates.—EDS.]

PROPOSAL FOR THE INTRODUCTION INTO IRELAND OF A SPECIES OF HIMALAYAN BARLEY. COMMUNICATED BY THE AGRI-HORTICULTURAL SOCIETY OF BOMBAY.

To JAMES HUME, ESQ., *Secretary to the Agri-Horticultural Society of India, Calcutta.*

SIR,—In forwarding the accompanying copies of letters received from England, I am directed by the General Committee of the Agri-Horticultural Society of Western India, to request you will have the kindness, if possible, to procure the seed therein alluded to, by asking some of your correspondents on the *Sutlej* to interest themselves in the matter.

I am further directed to say, that any expense that may be incurred in obtaining the seed, our Society will be most happy to defray, and will, at the same time, be most thankful to you for the trouble and time you may kindly devote to this purpose.

Agri-Horticultural Society's Office, H. BARR, *Captain,*
Town Hall, Bombay: 29th July, 1847. *Secretary to the Society.*

To ROBERT MCKIMM, ESQ., &c. &c.

DEAR SIR,—You were so kind as to promise me to give assistance, with some of your friends at Bombay, for the purpose of obtaining from *Rampoor,* on the *Sutledge,* some of the *Hordeum celeste,* a species of *Ooa* or *Jow* seed, which grows on the Himalaya mountains. My object in endeavouring to obtain this seed is to facilitate the benevolent wishes of a friend of mine in Ireland, who is very anxious to obtain it, with a view to prevent, in some measure, a recurrence of the distresses in that unfortunate country.

Annexed is a printed letter, which has been published in the Irish newspapers, by the gentleman alluded to above, explaining the properties of the seed in question, and shall be greatly obliged, if twelve or fourteen pounds of it, can be procured through any of your friends.

10, *Moorgate Street, London:* (Signed) James Child.
12*th April,* 1847.

To the Editor of the Evening Mail.

Sir,—As it is now, I think, generally conceded that the potato can never again be relied on as the staple food of the Irish people, it becomes the duty of every man, who may be in possession of information, not generally accessible to others, to put it forward, if it all affords a chance of supplying, even in part, an efficient substitute for that root.

This is particularly imperative upon those, who recollect that a failure in the wheat crop for several successive seasons, had, within the last ten years, induced many experienced farmers to believe that they might be compelled to give up its cultivation. Without further premise, I proceed to state the object of this letter.

I had once, many years ago, an opportunity of visiting the very remote districts, lying some hundreds of miles, north of the great Himalaya chain, and on the boundaries of the Chinese empire. I found growing there, in great luxuriance, a species of grain, which, although no agriculturist, I think I may venture to assert, might be, with great advantage, cultivated in this country. It was a species of barley, and, I believe, is known to scientific men by the name of *Hordeum celeste,* probably from its being principally grown in the celestial* empire, where I found it.

As a crop, it stood more thickly on the ground than any wheat I have ever seen in any country. The head or ear was shorter, but much fuller than the wheat-ear; and when the grain was ground into mill, we preferred it to any other we met in the course of a very extended journey, as both Europeans and Natives considered it as more palatable and more wholesome than even wheat.

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* "The epithet of "Celestial," may have been given to this barley, from the fact of its being grown, chiefly in the chain of mountains which is distinguished from the other ranges by the native term "Kailas," which signifies heaven. I mention this as a means of identification, as several species of "*Ooa*" or "*Jow,*" barley, are grown in the Himalaya."

The soil in which it grew was the high poor land, usually grazed by sheep and small black cattle, which extends for many hundreds of miles to the north of the great range.

The grain grew and flourished, as I have ascribed, in this poor soil at an elevation of from 9 to 11 thousand feet above the level of the sea; alongside it was growing the Tartary oat, also in great luxuriance; but the barley was more advanced towards ripeness by at least ten or fourteen days.

In many places the land was stony and gravelly, frequently the mere detritus left by the mountain streams; yet healthier or more abundant crops I never saw than both the grains I have mentioned in that bleak, sterile, and totally unsheltered region.

It will be necessary for me to state, that the elevation at which the *Hordeum celeste* grew, 10,000 feet, gives, allowing 300 feet of elevation to be equal to one degree, at least a latitude of 30 degrees, which, added to that of the place where I found it—32° 30′—will show that it might be expected to grow in a latitude of 63 or 64 degrees—very far north of the north-coast of Ireland. This fact, in connection with that of its being apparently a hardier plant than the Tartary, induces me to believe, that it would flourish in the high, bare, and unsheltered mountain-tracts which abound in this country.

I have only to add, that my native servants, who lived almost exclusively on grain, preferred it to any other they had ever met with. There now remains the question of how it is to be procured. It is obviously too late for the present year. Any of the great houses trading to the East Indies, could easily obtain it, by employing an agent at the great fair held at Rampoor, on the Sutlej, to which traders resort from all parts of India. That city is placed on the direct tract from the plains to the high districts of Kannawur, or Luddak, where the grain abounds.

I attempted to bring it to this country myself, but during my illness, and while I was unable to look to any thing, the grain was, unfortunately, placed in the hold of an Indiaman, and, as might naturally have been expected, lost its vegetating powers from the combined influence of heat and damp, during the voyage.

I have nothing more to add upon this subject, but that, at all events, the experiment of naturalizing the grain would be worth the attempt; and that should it be made, I hope most sincerely that the result may prove as beneficial as I anticipate.

VIATOR.

[On receipt of the above letter of Capt. Barr, the Secretary addressed Dr. Thomson, Surgeon to the Scientific Mission proceeding to Chinese Tartary, on the subject; also Dr. Jameson, Supt. H. C. Botanic Garden, N. W. P. The latter gentleman writes, that he has lost no time in taking steps to meet the wishes of the Society. Dr. Campbell, the Supt. of Darjeeling, has also most obligingly sent a quantity of a description of Tibetan grain, with a communication descriptive thereof, of which the following is an extract.—EDS.]

"A few days ago I despatched to your address by dâk banghy, a parcel containing a seer and a half of barley. Will the Society do me the favor to forward it to Capt. Barr, the Secretary to the Bombay Agricultural Society, with reference to his application for some of the "Celestial barley" of Thibet, noted in the last month's proceedings of your Society.

"The barley now sent to you is a Thibetan grain, grown near Darjeeling. It is a very fine grain indeed, being remarkable for the thinness of its husk and the size of the grain: this applies to it generally as grown in Thibet and Sikim, for the actual specimen forwarded is not an average one by any means, although the only one I could procure at this time. I hope shortly to send you a sample from which Captain Barr can more correctly judge of the value of the grain, but it may suit his purpose to sow this one, as the real character of the grain may be developed in the produce, although it would be more desirable to have an average sample of seed for the experiment. This barley is known in Nepal by the name of "Ooah."* It is brought to Cathmandu by the Thibetans from beyond the snows, but it is also grown on this side of the snowy range, in the tract known as the Upper Cachar. It is of a bluish tinge, as large as English wheat, and much cultivated by the Thibetans, who make the meal into bread, and use it dry with cold water, as the *suttoo* is eaten in India. The Thibetan name is "Na," whether it is the "*Hordeum cæleste*" or another variety, I have no means of ascertaining. It is grown in all parts of Eastern Thibet, and in Sikim it flourishes at all elevations, from 5,000 feet to those at the foot of the perpetual snows; where, however, the summer heat is considerable, and the progress of vegetation more rapid than in the tropics."

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* This is a "Newari" word I believe.

Darjeeling, 9th September, 1847.

REPORT OF A HORTICULTURAL EXHIBITION, HELD AT BHAUGLEPORE, ON 3RD DECEMBER, 1847.

(Communicated by Major T. E. A. NAPLETON, *Honorary Secretary Branch Agri-Horticultural Society.)*

The first show of flowers, fruits, and vegetables for the season 1847-48, was held in the Society's show rooms, on Friday afternoon, the 3rd December, and was exceedingly well attended both by the European and Native community. Mrs. Campbell, Mrs. Watson, and Mrs. Pontet most obligingly consented to test the specimens in the floricultural department.

Mr. G. F. Brown, Dr. Grant, and Mr. De Verinne, were good enough to act as umpires in the vegetable department. Before the competition for prizes was proceeded with, the committee just named inspected the vegetable produce of the public garden, which consisted of three baskets of very fine peas (including the famous sugar pea), a large basket of very fine new potatoes, raised from the acclimated Darjeeling seed. Two baskets of red and white nole-kole, a dallee of splendid cauliflowers, also of turnips, carrots, endive, lettuce, beet-root, onions, leeks, Tenasserim yams, Cabool capsicums, Windsor and French beans, nonpareil cabbage, turnip-radishes, West India arrowroot, Jerusalem artichokes, love-apples, &c.—and in the fruit department—citrons, shaddocks, plantains, sweet limes, &c., and pronounced the whole of the above-named produce to be unusually fine for this season of the year, and highly satisfactory.

The Honorary Secretary then brought to notice, that one Baboo Muddun Mohun Mitter, had been wonderfully successful in the cultivation of cauliflowers this season, having cut several very fine ones on the 1st November, and continued to do so ever since. The Baboo accomplished this by placing a palm leaf (erected as a chattah) over each plant during the rainy season.

A prize was awarded to the Baboo's gardener.

[Prizes were also awarded to eleven mallees in the vegetable department, for best specimens of cauliflowers, cucumbers, peas, cabbages, radishes, turnips, beet-root, lettuce, potatoes, carrots, nole-kole, capsicums, chillies, horse-radish, French beans, yams, tomatoes, and indigenous vegetables of sorts.]

[Prizes were awarded to five mallees for best specimens of flowers, consisting of verbenas of sorts, geraniums, zinnias, dahlias, roses, nolanas, asystasias, petunias, lavender, pinks, mignonette.]

There were some beautiful bouquets (cut from the public garden) on the tables, among which were dahlias. The Strelitzia regina, scarlet and other verbenas, tecomas, Salvia splendens, asystasias, geraniums, roses of 6 sorts, fine zinnias, lantanas, honeysuckles, mignonette, *cum multis aliis.*

No prizes were awarded for fruits, owing to the evening being too far advanced to admit of the judges to examine the dallees or adjudge prizes.

It is worthy of notice, however, that several branches of Java coffee plants, with ripe berries on them, were brought to the show from the garden of John Glass, Esq., also a splendid pineapple.

The following is a list of New Subscribers to our Branch Society since our last show on the 26*th May,* 1847.

F. Harley, Esq.; Lieut. R. Campbell, 47th N. I.; G. G. Balfour Esq., C. S.; Maharaja Roodur Sing, Bahadoor; Baboo Basdeo Sing; John Taylor, Esq.; Captain William Henry Ryves, Commandant 17th Irregular Cavalry; Edward Deedes, Esq., C. S.; H. C. Tucker, Esq., C. S.; G. C. Fletcher, Esq., C. S.; F. C. Fowle, Esq., C. S.; E. S. Pearson, Esq., C. S.; R. Cunliffe, Esq., C. S.; H. W. Tytler, Esq., Civil Surgeon; William Muir, Esq., C. S.; E. R. Morton, Esq.; H. C. Raikes, Esq., C. S.; J. P. Caulfield, Esq.; Moulvee Hafiz Surfaraz Ulleo; P. P. Carter, Esq.; Jean de Meiss, Esq. (since dead); W. Daunt, Esq.; Thomas Slade, Esq.; William Daires, Esq.; Moonshee Beneepershaud; Baboo Luchmenarain; J. MacLeod, Esq.; J. Brae, Esq.; W. R. Chill, Esq.; Quazee Uckbur Ulleo.

ON HYBRIDIZATION AMONGST VEGETABLES. BY THE HON. AND VERY REV. WILLIAM HERBERT, LL.D., F.H.S., DEAN OF MANCHESTER.*

I have mentioned that different species of Zephyranthes did not intermix willingly, but seedlings of Z. tubispatha by Z. carinata flowered at Spofforth, which produced no seed, and have been lost since. One was raised from Z. sessillis var. Guatimalensis by carinata, which has borne seed and fertilized var. verecunda. The dust of H. concolor and other species of Zephyranthes and Habranthus, and of Sprekelia formosissima and cinnabarina, has been very frequently applied to Hippeastrum, but always in vain. Hippeastrum, however, both here and in America, has willingly produced seedlings by the curious plant figured as Sprekelia cybister, and supposed by me to form a second section of Sprekelia, differing in the relative length of its several stamens and in the Hippeastrum-like breadth of its leaves. Professor Lindley was therefore right in looking upon it as an anomalous Hippeastrum; and I think it gives reason to believe that Sprekelia is rather a very strongly marked section of Hippeastrum approximating to H. aulicum than a genus *originally* distinct; in which case the question would be yet open, whether, under very favorable circumstances, a cross might not be still obtained, for no Sprekelia seems willing to bear seed in our climate and under our cultivation.

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* Continued from page 44.

The genus Crinum goes round the belt of the world not exceeding a certain distance from the equator. A portion of it was originally included in the genus Amaryllis, being supposed to conform with the Belladona lily, on which it was founded. The greater part of that portion breed as willingly with those within the old Linnæan limitation of crinum as with each other; but those from the west coast of Africa (although one of them, C. spectabile, is naturalized in Brazil) usually fail to breed with any other species. One of them, however, C. Broussonetianum, comes so near to the East Indian species, that Mr. Ker united it with them as a variety under the name Amaryllis ornata. I raised after repeated failures one seedling from C. Capense by pollen of C. spectabile, as I believe, but I lost the plant when two years old, before I could feel certain of its correctness. Here is one of the unintelligible freaks of nature; that is to say, one of the departures from analogy in the dispositions of the All-wise, of which I at least cannot fathom either the cause or the mode.

The genus Crocus, with great uniformity of aspect, branches into an infinity of species and local varieties, being found in peculiar situations and soil, but with greater similarity of habits and constitution than Crinum; and it might have been supposed that, when brought into cultivation, their seminal produce would become confounded. On the contrary, I have tried in vain for years to obtain any cross; I have not one as yet on which I depend; and, if I have any, not above three or four such bulbs, and about as many seeds. The cross-impregnation seldom produced a pod, and, if it did, the seed was usually shrivelled and bad. Look at the geological map of Bory St. Vincent. Half the island of Milo consists of igneous rock, half of marble and schist. On the schist he found C. lævigatus. The same schist appear in Thermia; C. lævigatus is there. I know that it passes thence to Hymettus and to the neighbourhood of the quarantine station at Zeitun. I doubt not that a like calcareous formation will be found there. But why does C. lævigatus jump from the summit of Milo to the summit of Thermia, and thence by Hymettus to Zeitun, without touching the hills of Epidaurus or Nauplia, or any part of the Morea, as far as it has been searched? I believe because the soil, subsoil, and climate, in which it grows, have forced Crocus to take that form and aspect which botanists call C. lævigatus, not that it has a predilection for such, for experience leads me to think, that few local bulbs or even plants prefer their native soil, though they are found in it because they can endure it, while the rivals, which would otherwise oppress them, cannot thrive vigorously in it. Many such are found to perish if potted or cultivated in their native soil removed to another situation, finding either an injurious increase or dimunition of moisture in the new position, which makes a different soil expedient for them there. Griffinia grows in mountain woods in very strong loam; it will scarcely live in such soil in our stoves, where it seems to like sandy peat. Ismene Amancaes grows in Bolivia in loam, strong enough to break an iron crow; here it must be cultivated in pure white sand. I find such European Orchideæ and Croci as grow in chalky or calcareous stuff, very much disposed to canker and die if potted in the like, while the fresh tubers and corms of almost every kind turn out well from a yellowish crumbling loam of moderate tenacity. No Crocus grows naturally in alluvial soil, probably because other plants would there smother it; but many, if not all, delight in it in a sufficiently dry situation, when cultivated. Different soils, therefore, suit the same vegetable under different circumstances, because in different positions they will have to contend with other difficulties and other rivals for the occupation of the soil. I consider a due quantity of moisture, without excess or deficiency, to be the main requisite to every plant which has peculiar local affections, premising that it must have space, unincumbered by stronger rivals that would overpower it, and a suitable temperature. I have found a blue Statice growing aloft in solid stone at the back of Portland island, and elsewhere on the brink of a runnel in a saltmarsh; I have found Gentiana verna on the firm turfy brow of the St. Gothard, and in the flooded marshes at the head of the lake of Thun. The clouds and the sea-spray and fog furnished in the high position that incessant moisture which those plants demanded, and which the rival grasses found to be superabundant for their use and injurious to their vigorous growth.

To return to C. lævigatus: one of two views must be adopted, either that schist, in a position where it receives a certain degree of moisture under a certain temperature, is essential to enable a variation of the genus Crocus, which originated in such a position to reproduce and maintain itself against all intrusion, or that the like data tend to produce a similar variation in different insulated spots; but it is not easy to suggest a satisfactory reason why such an indisposition to intermix should exist in a genus which branches into so many local species with so much general conformity both of habit and aspect. It has sometimes occurred to me, that the variations produced by circumstances of poverty, where the plant exists by superior powers of endurance, become more fixed than those which arise from luxuriance. Crocus seems to me to live in a state of constant mountain warfare, avoiding the presence of powerful rivals; Narcissi shoot both early and vigorously, and usually domineer over the grasses, &c., in the position they choose. The attempt to cross Crocus vernus with other species led to some interesting observations. Plants thereof were taken up and potted at the flowering season for that purpose. I found that no excision, however deep, of a flower that had expanded itself, and of which the pollen was set free before it was taken up, could prevent the underground germen within the sheaths of the plant from perfecting its seed in due time. The fertilization had taken place and could not be arrested. On the other hand, no application of its own pollen would fertilize a flower after the transplantation; the check received prevented the fertilization; prevented, as I believe, the plant from supplying that which the pollen required to enable it to elongate its tubes. But a further remarkable circumstance was observed. The roots so potted were plunged in a sand-bed, that they might be ready for the next year's operation without transplantation; but two seasons succeeded, and those roots produced no flower. A small bulb of a variety of C. vernus from the Splugen had been also potted two years, and did not flower. It was planted out, and no longer failed. What does this imply? I suspect that the relative cold and moisture of the crown and the base or fibres of a plant is an important point which cultivators have overlooked, and which may be one of the agents by which local variations have been produced. C. vernus on the Alps, at an elevation of 5,000 feet, frequently flowers by piercing the yet unmelted remnant of snow. In that position its head is wet and very cold, while its tail descends to the warmer and drier stone. In a pot at my window the vernal sun warms its head, while the pot detains the wet round its fibres and the evaporation from the pot chills them. The relative circumstances are therefore reversed. When I find that Crocus vernus does not descend below 5,000 feet on the mountains of the South of Italy, and that its near kin C. Imperatonius flourishes there between 2,000 and 3,000 feet above the sea, I cannot avoid suspecting that the variation was worked in times by-gone by the difference of position, and I ask myself whether the different relative moisture and warmth of the two extremities of the plants, and not the mere difference of soil and temperature, caused their diversity, and now prevent their juices from co-operating for mutual fertilization.

I will now turn to the genus Colchicum, not because I have raised crosses therein, which I have not tried, but because it well exemplifies the confusion of ideas that exists on this subject amongst botanists,* both as to facts and theory. Colchicum with great general similarity varies infinitely not only in different localities, but even in the proportions of the several flowers of the same plant. The natural consequence is, that many species have been described, insufficiently defined, and not easily determined, to which my own collections can make a considerable addition. A strong feature of difference is size; the bulb or corm of some being large, and the leaves wide and a foot long, while in others the bulb is small, and in one species the leaves almost filiform. Consequently, in R. and Sch. Syst. we find very long dissertations on the question of the identity or difference of several species of this genus, and Professor Bertoloni (Amœn.) refers a lot of them, great and small, to Colchicum autumnale, saying the difference is in proportion of parts, the smaller being from a more arid situation, and that it flowers earlier on account of the colder climate in which it dwells; meaning, I suppose, where the autumnal rains are earlier. There seems to be a disposition to accept this as sound reasoning; but what does he mean? I believe neither he nor those who would accept it know exactly what they assume. Does he fancy that the small forms are peculiar to dry and cold situations? I can assert that the fact is not so. I have found one of the very largest (which I propose to call C. pulchrum) on a high mountain in Cephalonia, very near to the small C. Bertolonicum and other diminutive kinds, and I have found small kinds not much above the sea level in Corfu. Does he mean that the small sorts, in which he sees some affinity to C. autumnale, will acquire the stature and proportions of C. autumnale when removed into the soil and climate in which it is found? The fact is not so; the small forms remain unchanged in cultivation. Does he fancy that the mean temperature of the southern hills, on which the small forms are found, is colder than the meadows of Yorkshire, in which the larger autumnale grows? The reverse is the case. Upon what principle then is it asserted that some forms, permanently very different, are of one individual species, and others in the same genus of several species, because they differ in having the margins of the leaf more or less parallel, or the stigmas straight or bent, and so forth? There is nothing rational in this; and yet the whole science of botany lies under that cloud. The true fact is, that Colchicum is one created type; that it has branched in by-gone ages into various forms, through various circumstances of climate, soil, subsoil, and altitude, and the altered features have become durable. In the subdivision of this genus or kind into existing species or permanent forms, the botanist has to consider, and guess as well as he can by analogy, what are the features which will prove permanent when the species is multiplied by seed in different situations. Cultivation will bring his specific divisions to the test, in the same manner that cross-breeding is the test of the genera or kinds. No man can be a consummate botanist without some access to horticulture, or at least some attention to its results. The greater number of botanical genera have been formed on the view of dried specimens, in which the parts collapse and cannot be truly discerned; consequently, I find scarcely a genus to which I have occasion to refer, in which false facts are not asserted, from the want of opportunity or industry to investigate truly and compare its general form with all its occasional variations. In the genus Colchicum, three sepals larger than the three petals which they enclose, the alternate length and insertion of the filaments, and the thickness of their base, are, I believe, true generic features. If they should be found deficient in any species, a thing which I do not much expect, it will be one of the many instances in which a feature becomes obsolete without affecting the general character of the type, as in the section Azalea five of the stamens of the genus (Rhododendron) are oftener deficient than present. Cross-breeding shows that such a deficiency is not original, but an incident. By true generic features I mean features that belonged to the type of the genus, whether that was the created type, or whether the genera themselves had diverged from fewer created individuals; an inquiry which would be superfluous and vain.

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* I wish to take this opportunity of doing justice to my scientific friend Dr. Brown, having stated incorrectly, Amar. Pr. Tr., p. 5, that the germen growing below or above the flower was undetermined in his order Asphodeleæ. I overlooked the word by which he indicated it, from its being misplaced, on comparing the definition with that of a cognate order.

The facility with which the larger Rhododendrons intermix with some sorts of Azalea is now well known, and it is quite clear that Azalea is a condition of the same genus, in which half the anthers are usually deficient (half in the perfect form being of inferior power), and the leaves disposed to be deciduous, although they are deciduous also in Rhod. Kamchaticum, Dahuricum, and one or more Chinese species. Some seedlings of the yellow Pontic Azalea frequently produce seven, eight, or nine anthers, and Indica with evergreen leaves has usually a fuller complement, but is much more unwilling to cross with the evergreen Rhododendrons, showing clearly thereby that the feature which had been assumed for the generic character, is even of less importance than some secret difference which we cannot discover amongst the species. Az. (so called) squammata has ten stamens. From Rhodora Canadensis impregnated by A. Pontica I obtained a plant (A. Seymouri, Bot. Reg.) which would everywhere pass muster as Azalea. It is therefore preposterous to look upon Azalea and Rhodora as other than strongly marked and defective sections of the genus Rhododendron. It was my original notion that the cross-bred produce from such plants, if placed alone in a soil and climate perfectly congenial to their fructification, would prepetuate the cross-bred type. I am satisfied that in many cases that would occur, but perhaps not where the diversity is as wide as between Azalea and Rhododendron. The crosses between the Nepal, Pontic, and American Rhododendrons are fertile, and doubtless would prepetuate themselves, though with a good deal of sporting. I formerly mentioned that the result from the impregnation of the shrubby Calceolaria integrifolia by Calceolaria plantaginea, which is quite as humble and herbaceous as a plantain, was remarkable, the whole produce having a similar aspect, that of a very dwarf plant, with long serrated leaves on very short stiff branches, the inflorescence being exactly intermediate between that of the two species. It appeared at first to be sterile, but last year I obtained a pod from it, and it has reproduced itself as perfectly as if it were a natural species from the mountains of Chili; set with the pollen of other hybrids it has produced handsome varieties perfectly herbaceous. The whole produce of the pod I have mentioned having been similar to the parent plant, and quite distinct in appearance from any other Calceolaria: there can be no doubt that, if they were planted in a wild spot, of which the soil, circumstances, and climate suited their growth and fructification, a new species, according to the terms and acceptation of botanists, would have been there established; and yet any person who cultivated Calceolaria integrifolia by impregnating it with C. plantaginea would obtain the like. We learn that most of the fine heaths of South Africa are very local. Above thirty years ago I announced that I had crossed E. vestita coccinea with jasminiflora (though Mr. Salisbury fancied they were of two separate genera, on account of the shape of the seed-pods); and it is now ascertained that Mr. Rollisson, of Tooting, raised E. jasminiflora by mule impregnation between E. Aytoni and ampullacea, and several others, of which no wild specimens have been found, and kept his secret until his death for the sake of profit. The genus Erica not yielding its pollen till the anthers are forcibly touched, and having the stigma therefore extremely likely to be hybridized in a wild state, there seems reason to believe that the species have been multiplied on the African wastes not merely by the variation of soil and position, but still further by the intermixture of the various forms which had so arisen. Such things occur occasionally even between plants widely distinct. A single bulb of Crinum submersum was found in a pool of water in Brazil in company with plants of a variety of C. erubescens, one of which had been impregnated by pollen of C. scabrum which grows on woody hills, and of which the pollen must have been brought by an insect or humming bird. I must not quit the mention of Rhododendron without stating that the mules of the late Mr. Smith of Norbiton by Azalea Sinensis were raised, as I know for certain, from a white Rhododendron of the cross between R. Ponticum and the white maximum, which abounds on the hills of Jersey in the United States, being a distinct local plant, impregnated by Azalea Sinensis; and that it is erroneously stated in the Ghent 'Flore des Serres' that they are crossed by Rh. arboreum. I saw the mother plant when the seed-pods were still green. Mr. Smith crossed R. arboreum with Dauricum sempervirens, but I could not prevail upon him to sell the plants, or house them, and they all died young from frost and neglect. My own Rh. Aprilis was raised from a Pontic Rhododendron by Dauricum sempervirens, and has made no seed.

Let us now take a view of the circumstances attending the genus Gladiolus. With the exception of the few species of which the lower lip is abbreviated, on which account those were erroneously formed into a separate genus Anisanthus by Sweet, they are pretty uniform in the shape of the flower, with much diversity of size, color, foliage, stature, and even seed, which last feature induced Sweet to build up another false genus Sphærospora. Forty years ago I first crossed the large and brilliant scarlet and white Gladiolus cardinalis with the smaller, but more freely flowering, G. blandus, which sports with white, purple, and rose-colored flowers, and (under the name of carneus, which was in truth rather a local variety of the same) of a coppery-flesh color. The result was a fertile breed of great beauty, of which the prevailing color was purplish-roseate. Crossed again with cardinalis it yielded florid plants, scarlet, copper-colored, rose-colored, white, and purple with endless variation. By a cross of the first mule and of cardinalis itself with G. tristis, of which the flower is pale yellow with brown specks, deeper tints and rich speckling were introduced, with a difference in the foliage and seeds, the seed of G. tristis being smaller and longer, its leaves rigid and quadrangular, the transverse section exhibiting a cross. The seeds of cardinalis are like those of blandus, but larger. There can scarcely be two species more dissimilar than cardinalis and tristis in any genus which has the form of the perianth uniform, the latter having such remarkable leaves, narrow, rigid, and erect, a slender stem, with night-smelling flowers, and the former very broad, semi-recumbent, glaucous foliage, and an inclined half-recumbent stem with large scarlet and white blossom ; yet the produce of these intermixed is fertile, and where the third species blandus has been also admitted into the union, it is fertile in the extreme (incomparably more so than the pure G. cardinalis), and by that triple cross the tall strong Gladiolus oppositiflorus of Madagascar has also produced offspring, which, though not disposed at present to make seed freely, has produced some this year. Again, the first of these mules was fertilized by G. hirsutus (known at the Cape by the name roseus), a plant with flowers straighter than usual in the genus, and strongly scented, the leaves hairy and margined with red. That cross has not as yet proved fertile. The same G. hirsutus was crossed by Mr. Bidwill at Sydney, where the Cape bulbs thrive more freely than here, with G. alatus (which Ecklon wished to turn off into a genus Hebea), having hard, rigidly-ribbed leaves, a short stem, and orange flowers. The cross-bred plants flowered here last autumn, being intermediate in foliage and flower. The only opportunity I have had of crossing G. alatus with the first-named mules was defeated, notwithstanding much precaution, through the introduction of pollen by the humblebees, which are dangerous marplots to such experiments. The showy G. Natalensis (called also Psittacinus) of the Natal country, which endures more frost than any of the southern Gladioli, though it suffers much from July rains in many positions, has been freely crossed by myself, by Mr. Belfield, by Mr. Bidwill, and by cultivators on the Continent, with G. oppositiflorus, a Madagascar plant, found perhaps also in Caffraria, and often called improperly in the shops floribundus, an old name for a very different plant. The cross named

G. Gandavi (for the adjective name Gandavensis to a garden cross is very objectionable) has been figured in the beautiful Ghent periodical work of M. Van Houtte and his fellow-laborers in botanic and horticultural science. It is there stated most erroneously to have been raised between Natalensis and Cardinalis. It flowered at Ghent for the first time in Europe, the soil and climate being much more congenial to Gladioli there than at Spofforth and in the west of England, but some of the seedlings raised in Devonshire and taken to Sydney had flowered earlier. Abundance of beautiful seedlings have been raised here and abroad between cardinalis and oppositiflorus, and *vice versâ*, many of which have been sent over from the Continent under the name G. ramosus, as if they were plants of a natural species. Those from abroad have generally perished soon here, the soil and climate being too damp, but my own seedlings, probably the opposite cross, have a much stronger constitution, more variety of color, and have this season ripened much seed. This statement might perhaps induce the reader to think all the species easily convertible ; but it is not so. If I am asked why, I can only say, that the ways of God are not as our ways, and are past finding out. The cross erroneously stated to have been made between G. Natalensis and cardinalis, if not absolutely impossible, is so difficult, that repeated attempts made during successive years by myself, and by J. Trevor Alcock, Esq., who interested himself in this matter, and probably by many others, have all proved abortive ; and no cross has been effected, as far as I know, between G. Natalensis and any species from the Cape territory, although both Natalensis and the Cape species mix readily with the Madagascar plant. I am now trying whether the cross G. Gandavi, being half-blood, will mingle with the Cape species, and the result is not yet quite certain. I lately set nine flowers of G. oppositiflorus with pollen of G. hirsutus. Large pods were readily produced, but unexpectedly they proved to contain only chaff and perishing kernels, the fertilization having perhaps extended to the seed-vessel and the outer coat of all the ovules, without having vivified them ; but I believe one frosty night in August caused the failure. Five equally fine pods were produced at the same time on a scarlet ¾ cardinalis mule. Few of their ovules were at all fertilized, and the greater part of those were chaff, but a few apparently good seeds were amongst them, which will probably vegetate. G. Gandavi itself has ripened its seed three successive years ; and one from the first batch of its descendants is now in flower. It preserves the cross-bred type, and might be accounted a distinct species, if I did not know that it was raised from oppositiflorus by pollen of Natalensis. It reverts, however, a little towards the male parent, the purple stripes of the female parent being less strongly marked than the original mules, and the flower is scarcely as large or bright-colored, following the course I have observed in other cases, that seedlings from a cross-bred plant by its own pollen sometimes degenerate in the size or brilliancy of their flowers.

We must next turn to the Gladioli of the northern hemisphere, there being, however, a plant of intermediate position, G. æquinoctialis, on the heights of Sierra Leone. The northern Gladioli are all purplish, with a tendency to rose-color, and in a few cases to blue, excepting the whitish and the white varieties. They peremptorily refuse to breed with the Cape species; and, although I will not say that the cross is impossible, I have failed in so many attempts that I have abandoned them. But although the northern species differ somewhat from those of the Cape territory, and agree with G. Natalensis in a more direct presentation of the flowers to the front from an erect stalk, there are a great many different local forms of them, with a great general similarity of aspect and intermediate forms, which almost defeat the attempts to distinguish them specifically, but furnish, with a similarity of flower, a strange diversity of seeds—the winged or foliaceous margin of the African species being conspicuous in Byzantinus, communis, Boucheanus, and some others; totally disappearing in G. segetalis, Fischerianus, and some others; curtailed in some varieties, and almost obsolete in others, of G. communis. The gradual curtailment of that margin in varieties of communis, as well as the close resemblance of G. segetalis to them, shows that the separation of the latter as a genus is preposterous. But there is another strange circumstance connected with them, which tends to show how species originate. G. Byzantinus will grow and increase greatly in almost any soil or situation; G. segetalis is very apt to die at Spofforth—I supposed it tender and fearful of wet. The white Gladiolus commutatus of Bouché, communis albus of the Dutch, but in truth a white G. segetum, always dies at Spofforth—I believe they perish because the soil, however good for barley, is too light for them. Near Trieste and in Santa Maura G. segetalis engrossed strong yellow ploughed land that lay flat and wet, and was also pestered by Aristolochia clematitis; but G. Illyricus is only found in meadows of alluvial soil subject to inundation; and where I saw it in flower in May, near Trieste; the sod was then three inches under water. Yet these three species require nice discrimination to separate them. Their case is somewhat like that of the wrens, Silvia sylvicola, trochilus, rufa, loquax, and Temminckiana, which are only distinguished by skilful persons, yet differ greatly in note, nest, and habits. Although the northern Gladioli, which conform with cardinalis, &c. as to their seed, will not breed with them: I believe, on the contrary, that there is no obstacle to their breeding with their European congeners that have round, unwinged seeds. In the genus Schizanthus, retusus refuses to breed with pinnatus; though they conform with each other in all respects except the size of their seeds—a circumstance which is not an obstacle in Gladiolus, but is so in Anomatheca, as I have already stated. I can suggest no direct solution for that mystery; but some difference of constitution probably prevents the pollen from deriving what is essential from the juices of the female plant. I should conceive that

G. Byzantinus and communis, which have seeds like the African sorts, and are not particular as to position, are nearest to the northern Gladiolus of the oldest days; that some of its offspring, having fallen into peculiar situations, have acquired constitutional peculiarities, with some alterations of aspect and structure, that have become fixed characters.

There are some classes of plants with great diversity of forms, but so graduated as to render it almost impossible to subdivide them satisfactorily into distinct genera and species. I find the undescribed Colchicums from different localities varying so much from each other generally, and yet so little fixed in their own usual peculiarities, that all specific names for them seem vain. Again, the difference which separates Colchicum from Merendera, viz. a compact slender tube in the former, and in the latter, instead of a tube, six long slender bases to the leaflets of the limb, which are fastened together by little hooks at the mouth of the seeming tube, but easily separable, would appear to furnish a good generic distinction; but the perfect agreement of the two in habit and general appearance induces me to think that they were united even in comparatively late periods of the world, and I should expect to find them capable of intermixture, and I shall take the first opportunity of making the experiment. The Sisyrinchioid plants include a mass of individuals which it is most difficult to class under distinct genera, but which are very remote from each other in habits and appearance, and they slide away through the Tigridialike plants towards the real Irises and their near kin, in a manner that cannot [illegible] brought within the scope of regular systematic views. When we turn to the multitudinous irridaceous plants of the Cape territory we find [illegible] less difficulty, and the subdivisions are baffled by forms, of which it is difficult to dispose consistently. Sweet's small Orthrosanthus multiflorus was naturally remanded by Dr. Lindley to the Sisyrinchiums, because its flower seemed to conform with some which were not peculiarly allied to it; but no person can look on Mr. Mangles' Orthrosanthus cœruleus, a plant of the largest growth amongst those races, and another lovely species introduced by him, which I call O. gracilis, and not at once recognise the aspect of Orthrosanthus, the inflorescence being borne on the axils of the flower-stems, instead of being simply terminal, which is a feature of considerable importance, and seems to indicate that the race is at least now distinct. We are laboring, therefore, under great difficulty in assigning the just demarcations to the genera or kinds; and it is evident that attention to the cultivated forms, and intermixture of plants is no less essential to botanical knowledge than the inspection of wild specimens. By that we are enabled to learn how far the offspring of individuals can sport at the present day, and how far those which seem to be distinct are capable of union; and by a survey of the results it may perhaps become apparent at last whether that union is in truth only a reunion of things that have been severed in ancient times.

The genus Hymenocallis was mainly separated into species, as Dr. Roxburgh had distinguished the East Indian forms of Crinum, by the proportionate length of the tube and limb. That answered tolerably well as a prevailing feature, while the known forms were few, although we often found great difference in the proportion of flowers on the same umbel; but the species have poured in upon us from so many localities, without certain indications of their natural habitation, and so many mules, bred accidentally as well as intentionally under cultivation, have been mixed with them, that it becomes almost vain to attempt to continue subdividing them further into species; and it can only be said of each fresh variety, without the particulars of its habitation, that it is an Hymenocallis. I was able on the first sight of two forms brought by Mr. Cuming from Manilla, though new to me as to their peculiarities, to say that he had got them from a garden where they had been probably introduced on the removal of some governor and his family from Spanish America to the east, because Hymenocallis is peculiar to the western hemisphere; and he at once admitted the fact to be so. The more deeply plants are investigated, the more will it be felt that the establishment of kinds or genera, the discrimination of their higher affinities, and the pursuit of specific diversities to their local habitations and associations, with research into the causes that are in operation there, are the duties of the botanist; but that the distinctions between species and variety are not sufficiently substantial and positive for any scientific reliance to be placed upon them, and that a dispute on such a distinction is waste of words and battling with the air. The genus Hymenocallis, however, though sliding into variations almost indiscriminate, is perhaps one of the races most deserving consideration of all that exist in the world. It is confined to the New World (that is, to the American continent and the West Indian islands), within a certain range from the equator; it rejoices in wet, and in cultivation may be kept in pots immersed in water. I have not found any one form of it object to immersion during its season of growth. In the form of its flower it approximates, especially through H. speciosa, which has the filaments shorter and rather converging to Pancratium of the Old World so nearly, that it is difficult to separate them very satisfactorily by the inflorescence, though the stamens of the former have rough pollen, and are longer and looser; those of the latter stiffer, shorter, and conniving But no Pancratium has been found in a swamp; they abhor excess of wet, and one which it is difficult to cultivate, P. tortuosum, *mihi*, grows in the sandy desert of Arabia, near Gedda. Pancratium has shelly black seeds, and Hymenocallis large, fleshy, green seeds, which have been usually called albuminous, so that they stand in two widely distinct sections of the order Amaryllidaceæ, separated by a feature which in other orders has been admitted even amongst the insuperable limitations of the order itself. Will Pancratium and Hymenocallis now blend their offspring? I believe they will not; and, if produced, I am persuaded that it will be sterile. Were they created distinct from each other at the beginning? I cannot compare their flowers, and presume to say that I think they were. I will now state a fact which I had hoped to elucidate further, but either I had not opportunities of repeating the experiments, or other matters prevented me from availing myself of them. At p. 211, Amar., I gave a detailed account of the origin of four seedlings, called H. amœna var. lorata, *hortensis*, from four weak discolored seeds of H. amœna, which had been deprived of its anthers and touched with the pollen of another genus. That pollen was taken from P. Illyricum. The lorate leaves, and the weakness and discoloration of the seeds, at first made me think that a bigeneric cross was obtained; but there was no increased hardiness of constitution, and no difference in the inflorescence derived from the male parent. I have, therefore, no reason to assert that P. Illyricum had had any influence. Accidental admission of its own pollen, or of that of some other Hymenocallis in an impoverished and half-effete state, probably produced the variety. The four seedlings were precisely similar to each other: they have not often flowered, and have not borne seed, but they have been rather neglected. It is desirable that further experiments should be tried on Hymenocallis by pollen of P. Illyricum, and *vice versâ*; but I do not think they will blend, though I am a little less confident on that point than I should have been some years ago. If these four seedlings had been raised by the accidental access of pollen nearly effete from some other Hymenocallis that had flowered lately in the same house, their flower should have been modified. Is it possible that a grain of its own pollen, nearly effete, had touched the stigma, in spite of my precautions, and that its defect was the cause of variety? If so, an important clue would be obtained. Is it possible that the pollen of the cognate genus Pancratium, without being able to fertilize the ovules, could help the defective grain of its own kind to some ingredient in which it was defective, and so obtain some influence over the produce, without being actually its parent? If, as I believe, two grains of pollen cannot act simultaneously in the same ovule, that could not be; but it is a point open to inquiry, and upon which I merely say, that where I have carefully mixed the pollen of twelve species of Calceolaria, that of one only took effect, and that I have not succeeded in any attempt to effect a double or mixed fertilization at the same time.

In former publications I laid very great stress—and I now believe too much stress—on the form of the fruit, for I think that important part of vegetation is no less capable of modification and change than other parts thereof. The extensive genus Iris, with great general similarity of aspect, exhibits some anomalous diversities. In Iris setosa, otherwise very like I. Virginica, the conspicuous erect petals of the genus have disappeared, and given place to three slender bristles; in Iris Sibirica, and the species closely connected with it, the solid flower-stalk has become a fistulous pipe; in the Gladdon, the outer and second coats of the seed, which in the fistulous sorts is hollow, becomes filled with pulp, and the seed assumes the color and semblance of a ripe berry. The bulbous races have their own peculiarities. Theory and experience lead me to think that the whole of the extensive bearded race that occupies the Mediterranean formation and its skirts, creeping on as far as Nepal, from the many very dwarf species to the large Germanica and pallida, are easily convertible and stand almost on the footing of local varieties. I cannot blend them with the fistulous Siberian or with the species belonging to the Virginian type. I think the bearded Mediterranean, the fistulous Siberian, the Virginian type, the Gladdon, the bulbous race, perhaps the American vernal, the so-called genus Dietes, and some other portions of Iris, to have been departures from the first created type, which occurred in much older times than the more extended diversification of species, and that we shall now find it difficult, if possible, to pass those limits in cross-breeding; and such is my view of the whole vegetable kingdom, though in some families it will be found more easy to confound the new forms and revert to ancient associations than in others. In the genus Rosa (though herein I speak from observation and not from experience) there is probably no impediment, not even respecting R. berberifolia, the singular link by which the rose is connected with the Cistus. In Rigidella, on the contrary, it is most difficult to cross the two pendulous species, and I am not sure whether I have at last succeeded in effecting it or not, though the plants are very conformable, except that one flowers in the morning and the other exactly takes its place in the afternoon. The genus Pelargonium, as well as Calceolaria, has furnished much beauty to florists who have crossed *ad infinitum* the different varieties first obtained by hybridizing. Pelargonium has been subdivided into various genera, which have not been generally adopted, because their limits are obscure and unsatisfactory; and it is only by trying to cross them that we can find where the positive impediments lie. It is impossible, as far as I have seen, to cross the race to which the horseshoe scarlet belongs, or that to which tricolor belongs, with those which the florist has intermixed. With very little apparent structural difference, there seems to be a secret insuperable bar; and I think they were probably severed in a much earlier period of the world than the kinds which will breed together. The first great step for the florist in that race was the production of the plant called Ignescens, by the intermixture of the family, to which betulinum, Citriodorum, &c. belong, with a tuberous-rooted scarlet one, that might however have been thought less likely to breed with them than those which refuse to do so. The fertility of that plant set wide the doors of innovation, but the stream is confined within certain limits. Florists, however, have not availed themselves of the further help they might have drawn from the colors of the tuberous sorts that might be brought into action, their aim being directed more to size and form than to variety; but as the scarlet-color has been drawn from a very small flower to one as large as their rising-sun, so the blood-red of P. sanguineum, as well as the black and the yellow of the tuberous kinds, might probably be brought into like conspicuous manifestation.

I am not aware that any difficulty has been found in crossing the various species of Fuchsia; but the natural forms of F. virgata, gracilis, globosa, and discolor, appear to me so superior to the mixed shapes produced by gardeners, that I have been unwilling to deteriorate them by intermixture. In one Fuchsia of a mixed race I was struck with the appearance of the green color of the fruit of F. fulgens, but more vivid, though in all other respects it seemed to conform with those that bear red berries. As the natural green fruit of Fuchsia is agreeable to the taste, it is possible that a hardier green-fruited race may be obtained with the same quality. The supposed sterility of mules has very much deterred cultivators from trying how far plants that bear palatable and wholesome fruit may be intermixed, and, excepting Mr. Knight's experiments, very little has been done in that branch. Our climate does not suit experiments, to ascertain whether the lemon, orange, shaddock, citron, and lime are indefinitely convertible, and, if not, exactly what insurmountable impediments occur; but I believe no one has even tried to blend the very highly-flavoured Fragaria viridis with the larger and more fruitful kinds, and gardeners adhere to the chance of improved seedlings from the most approved individuals, though they are aware that size, without flavour, is unsatisfactory. It is remarkable that in some genera bearing eatable fruit the crosses are usually fruitful, and in others not—a circumstance which requires deep investigation. The few mule Passifloras raised seem indisposed to make seed, and still more to fill the fruit, if formed, with succulent pulp; but it does not follow that the case will be such with all. P. quadrangularis bears a large, rich-flavoured fruit in a stove under peculiar treatment; edulis, a better-flavoured fruit, in a greenhouse; laurifolia and maliformis, very different fruit, in a stove; a small species sent to me by Mr. Maclean, from Chorillos above Lima, under the name of suffruticosa, bears a delicious fruit of the size of a gooseberry in a stove; P. alata, nearly akin to quadrangularis, has a vile fruit; cærulea, no better; but it remains to be tried whether no hardier species of passiflora will give a fertile, succulent, and well-tasted fruit by intermixture with the best, tenderer kinds. In the genus Cactus it is so. Well-flavoured mules are obtained at once from C. Ackermannianus, of which the fruit is very bad, by crossing it with C. speciosissimus or Phyllanthoides. It is remarkable, that in the section Cereus the mules are as fruitful, and have the fruit as juicy, as the natural forms, however dissimilar. Nothing can be more unlike each other in the same genus than the two species I have last named, yet they breed willingly together, and the fruit of the mule differs from that of either parent as much as the flower. I stated (Amar. p. 345) that I could not see a single point in the generic character of Echinocactus to separate it from Cereus, and that I expected them to be found able to intermix. I observe that it was once proposed to take the stem as the distinctive generic feature, unless it should be thought better to combine them in one genus. To that I say, that, while species of Cereus disagree, in that some of them have fleshy, angular, thorny stems, and others flat, leaf-like, smooth stems, but are proved to be of one genus, we have not sound grounds for separating Echinocactus on account of such a feature; and I contend that the separation is a question of fact, not of option and preference, as if the botanist were a commissioner to set out the fences for an enclosure of waste lands. I have very few Echinocacti, and have had no opportunities of testing the point; but I requested Mr. Beaton, a most intelligent gardener, when he had the care of Mr. Harris' rich collection, to do so, and he very soon sent me seed from the mule Cereus called Jenkinsoni by Echinocactus Eyresii, but they were only outwardly perfect, and did not germinate. If he had remained longer there, I think, he would have effected the union. Mr. Beaton produced the cross between Ribes sanguineum and one of the yellow-flowering species, which brings that genus to my recollection. The gooseberry and red or white currant are held to be of one genus, but it has not been found practicable to blend them, and probably it is not; but it does not follow, because they will not breed together directly, that they might not through some other species, as in the genus Gladiolus, G. cardinalis and Natalensis refuse to mix with each other, but do freely with G. oppositiflorus. Since both these crosses with Oppositiflorus make seed, I consider that, by perseverance, the impracticable cross can be nearly forced, by reducing both crosses one step further from the dissentient parents, till the two crosses are found able to intermix, and then crossing the produce upwards, step by step, with a greater approximation to them. I am not aware that any attempt has been made to cross the acid with the sweet currants, which might so perhaps yield a new and pleasant fruit, and the attempt should be made. It is very difficult to foresee which combinations, when made, will produce a fruitful offspring. The genus Nerine strongly exemplifies that difficulty. It consists of two portions, those with regular corolla and straight filaments and style, and those which have them bent and the corolla distorted and inclined. There is a cross section of the genus not tallying with the above-mentioned distinctions, viz. those with centripetal inflorescence, *i. e.*, beginning to flower on the outside of the umbel and flowering last in the centre, and those with centrifugal inflorescence. The cross between N. curvifolia of the first section and pulchella of the second is very fertile, both being centripetal; that between N. curvifolia and undulata of the second is absolutely sterile, because the latter differs in being centrifugal. The mule, however, follows the male in being centripetal, but is quite barren. A difference, therefore, which had been overlooked by botanists till I observed it, seems to be the outward mark of the impediment which makes the mule unfruitful. Cross-breeding, therefore, shows that feature to be more important than it had been thought.

The blending of colors amongst cross-bred plants is rather capricious. The golden-flowered Swedish turnip crossed with the yellow-flowering white turnip did not give an intermediate shade of color, but some plants with golden and some with yellow flowers. The orange and the blue Anagallis gave a pale, dull pink. The scarlet G. cardinalis with a white G. blandus, and with the yellowish G. angustus and G. oppositiflorus, gave a purplish-rose color. Rhododendron ponticum and Rhodora Canadensis by the yellow Azalea very much discarded color, instead of taking an intense mixed hue. The yellow and red-flowered Ribes, however, gave a dull rust color. It generally requires two crosses from the scarlet to fix the bright color in the mule. G. Natalensis impresses its color much more strongly on G. oppositiflorus than G. cardinalis does, being more nearly akin; whether from that cause or not I will not presume to guess.

Hybrid Alstrœmerias have been raised, but with difficulty, and they seem delicate. I believe it was a mistake to suppose Mr. Van Houtte's fine collection of many-colored Alstrœmerias to be cross-bred. Poeppig had long ago informed us that A. hæmantha sported in the Subandine meadows of Antuco with every shade, from white to citron, orange, rose-color, vermilion, and crimson; and I believe his plants to have been obtained by seed from that quarter, which I had long vainly tried to obtain. I have raised a Bomarea between variabilis and acutifolia, which seems to be fertile. I do not believe it would be possible to cross a Bomarea with Alstrœmeria. I think I may venture to say that, as far as I have observed, the prevailing disposition of cross-bred vegetables seems to assimilate more to the male than to the female parent, though the appearance may possibly be sometimes the reverse, and often strictly intermediate; but as far as I have seen, if we obtain a cross between a hardy and a tender species, the produce, where the male is hardy, will be much more hardy than where the female is hardy and the male tender. This is very important and very conspicuous in cross-bred rhododendrons. I do not think it is so with animals, where the cases seem analogous. Having bred many horses, I have found mares that were roarers almost invariably produce roarers, and very little, if any, evil occur from breeding by a roaring horse. Many years ago Mr. Milne, of the Fulham nursery, obtained three mules, which are well known, from Passiflora racemosa set with the pollen of cœrulea. The produce did not require stove cultivation, like the female parent, but they have been generally sterile. From their first distribution to the present day they have grown in my cool conservatory, flowering abundantly, but sterile, with this exception, that many years ago one shrivelled, pulpless fruit was formed and ripened, containing twelve good seeds, which vegetated. The flowers of all were nearly similar to those of

P. cœrulea, the male. One of them is growing in the same conservatory, with the flower, I think, rather finer than that of the common cœrulea, and it has never borne fruit. The rest having been planted or left out of doors at different times, have been killed by frost or neglect. At the time when this dry fruit was ripened, there was a plant of P. cœrulea in another house in the garden, though disconnected, and eighty or ninety feet distant. Therefore, either the flower was fertilized by pollen of cœrulea brought by an insect or by accident, and two crosses by the pollen cœrulea, made cœrulea itself from the ovary of the tender scarlet racemosa, or the mule was fertilized by its own pollen, and the offspring diverged to the male type, throwing off the similitude of the female altogether. The natural cœrulea did not fruit here while I possessed it, and it dies when planted out at Spofforth.

I have already stated the possibility of raising the poetic narcissus by two or three crosses from a daffodil, and I have also shown that the Gladiolus crossed from G. oppositiflorus (which breeds freely with the Cape species) by pollen of G. Natalensis (which will not), produces seedlings, one of which having flowered, reverted a little towards the male type. Here then we have the like fact. The Passifloras were produced by the pollen of the mule, or by accidental access of the pollen of the male parent. If by the former, these widely-separated species are convertible, and a new form originates from their union; if by the latter, the male type may be obtained by repeated crosses from the ovary of a very different plant; and, whichever be the case, the origin from one created kind is proved in that instance, and, by implication, in all cases of similar difference. I believe all the Cape species of Gladiolus to be convertible; I have found no positive impediment. The rare G. abbreviatus might be almost made between G. cunonius and tristis; it has the curious leaf of the latter, and a flower approaching to that of G. cunonius. Mr. Plant's mule consists of the two, with the addition of G. cardinalis. Perhaps I have forgotten to mention that Corbularia will not breed with the other Narcissi. I have crossed the common honeysuckle with hirsuta, lutea, and Fraser's scarlet; but the berries of the latter were devoured by a robin. It is advisable, in such cases, to tie a cap of muslin over the bunch of flowers, both to exclude pollen and ward off the robins and blackcaps at a later period. I have had a whole umbel of berries, supposed to be poisonous to man, of Hæmanthus multiflorus eaten in one morning by a friendly robin in the stove.

I mentioned in a former treatise a remarkable circumstance concerning the purple hybrid laburnum, on a plant of which a small branch with the habit and nearly the leaves and flowers of the diminutive Cytisus purpureus had sprouted and maintained itself in the garden of my brother. The circumstances, which afterwards came to my knowledge concerning that remarkable plant, are still more extraordinary. In the garden of the late Mr. Loudon, at Bayswater, upon a large shrub of the same hybrid, one of the limbs resolved itself into its elements, diverging into two branches, one of which had the small weeping habit, leaves, and flowers of C. purpureus, the other nearly the leaves and racemes of yellow flowers belonging to the common laburnum; and those two branches ripened good seed, while the rest of the shrub producing the hybrid blossom was absolutely sterile. The seeds borne by the smaller branch were less abundant, and had been lost; those on the yellow branch were plentiful, and I raised many plants from the seeds, which were kindly given to me by Mr. Loudon. They returned nearly to the form of the common laburnum, excepting that two of the seedlings showed a little purple tinge on the green stalks, which might perhaps, have extended to the flowers, but they were lost by neglect. In the same season the diminutive branch on my brother's tree bore seed, and from it I raised plants, differing very little from the usual C. purpureus. I have since learned that in many places, where this mule has stood some years, the like phenomenon has appeared. The history of the plant is, that it was not raised from seed, but made its appearance in the following remarkable way:—A number of stocks of laburnum had been budded with C. purpureus in a French nursery-garden, and the bud on one of them died; but the wood and bark inserted lived, as frequently occurs in such cases. After some time new eyes formed themselves, one of which produced this hybrid, C. Adami. I suggested, in a communication to Mr. Loudon, that it must have broken from the exact juncture, and proceeded from a cell of cellular tissue formed by the union of two cells, which had been cut through, and had grown into one, and which, therefore, belonged to the two different plants, half a cell of the tissue of C. purpureus having been spliced to half a cell of C. laburnum. The necessary consequence would be that a bud formed from that compound cell would derive qualities from both species, but qualities less fixed and innate than those which are derived from generative union. This has been looked upon as a speculation, but I consider it nearly amounting to a certainty, because I think that the consequence is necessary, and that the phenomena cannot be accounted for in any other manner; and nothing of the sort has occurred to any known mule production, vegetable or animal. Since that time my brother's shrub has put out many of the large-leaved yellow branches and of the small branches, and they are fertile. It occurred to me that it would be a confirmation of my view, if the reverted branches of each kind should keep to opposite sides of the stem; and on examination that proved to be decidedly the case. Whether that circumstance occurs elsewhere or not, I do not know; but it looks as if one side of the wood adopted the character of one-half of the original cell, and the opposite side the other character. I think that clever gardeners might thus obtain crosses between plants which will not intermix seminally. The olive and privet might be tried with hope of success; for the privet, when the olive is grafted upon it, is very persevering in throwing shoots from the old wood. A long slice of privet should be inarched on the olive with a very sharp and clean cut of both the woods, and then teized by rubbing off the buds, till it breaks on the exact suture. Of course many failures must be expected before a bud will be obtained from a compound cell; but I think, with perseverance, it will be produced; perhaps most easily by uniting half of two young stems of equal bulk from just above the root upwards. Let us, however, pause to reflect on this phenomenon, whatever be the mode of its operation. Here we have not only two plants, so very dissimilar as the almost arborescent yellow laburnum, and the weak, humble, small-leaved, purple-flowered Cytisus purpureus, produced from the seed of the same individual; but, if we strike cuttings from the two varying branches, we have the individual plant itself actually resolved into its elements, and those perfectly separated. Can we for a moment hold, after contemplating that fact, that the Almighty certainly created those two plants distinct, and allowed them to become, from two individual kinds, one; and from one be resolved again into two? Have we any analogy in the vegetable or animal kingdom that can warrant such an extraordinary doctrine? and is not the plain inference, that they were one individual kind when they proceeded from the Creator, and are so still, though diversified in appearance? If two plants so dissimilar are admitted to have so diverged, the like course of change must be attributed to other genera also; for I cannot think it will be shown that those two are by any peculiarities entitled to form an exception from the general law imposed upon vegetables. The only things that I know at all analogous are these, that a layer from a striped carnation, that has run to red, continues so; that a branch of the variable Pompone variety of Camellia Japonica, that has run to red, continues so also; that branches of the copper-colored Austrian briar occasionally revert to the usual yellow color, and the peach and the nectarine have been known to be produced on the same tree from one source; but in those cases there is no supposed diversity of kind, or even of species. The seminal variety in the three former cases merely falls back to the more usual color; and in the latter, two different cultivated improvements of the almond manifest themselves in the same plant. Whatever analogy they offer, confirms the view of the original identity of laburnum and Cytissus purpureus. It must be remembered that, if the smallest piece of bark be inserted into a different stock, and lives, whatever bud shall break from its tissue, exhibits the qualities of the plant from which that piece of bark was taken, without regard to the juices, root, or bark of the stock. If it proceeds from the stock, it exhibits its qualities; if exactly from the suture, how can it avoid exhibiting the joint qualities?

I know not whether C. laburnum and purpureus can be made to intermix seminally. The very handsome Erythrina Bidwilli, which flowered at Spofforth last August, having been sent to me from Sydney by Mr. Bidwill, and raised in that neighbourhood, either by himself or by Mr. M'Leay, from E. herbacea by pollen of E. cristagalli, is, I believe (unless Wiegman's asserted mules, between vetches and beans, were truly raised), the first well-authenticated hybrid amongst papilionaceous or pea-shaped flowers. Mr. Knight only blended varieties of the pea. The papilionaceous forms are, however, so numerous, and the genera are divided by such inconspicuous differences, that it might be supposed that their intermixture would have been easy and frequent. Why they are of rare occurrence I know not, and have not tried to cross them. In this case the union of the two plants is remarkable, because the former produces its spike of flowers directly from the root, the leaf-bearing stems being barren, while the other parent is almost arborescent in a favorable climate, and blossoms from the axils and ends of the leafy branches, in which respect the mule follows it. Wiegman asserted that he had obtained fertile mules between the vetch and the bean, by merely making the plants grow in contact, tying them together, and leaving the operation to the bees. I mentioned formerly that there exists in England an obscure plant, which is a strong, handsome, pink-flowered prehensile pea, and bears fruit that has the appearance and flavour of a small bean. At the time I mentioned it, plants of the kind were fruiting plentifully in my curate's garden. This is an important fact in the consideration of our subject ; for, if it is a cross between a pea and a bean, being very fertile, it must prove the singleness of their origin ; if it is a variety of the pea having acquired and perpetuated the fruit of a bean, it seems to give the same result, that the two must have proceeded from one created type. When the generic characters, as ultimately stated by Endlicher, of Pisum, the pea, and Vicial to which the bean belongs, are carefully compared, it will appear that, except a little prolongation and straighter position of the flower, which in some other races would be immaterial, the only fixed feature of difference is the asserted roundness of the seed in the pea, and its lateral compression in the vetch and bean, a feature which, if the fact were undeniable, is insignificant in many other genera. If the pea, vetch, and erect bean have sprung from one type, and are convertible, to what result does that fact lead us ? Can we maintain a multiplicity of created roses, cistuses, potentillas, cornflags, and irises in the face of that fact ? Are we not forced thereby to the points, which I urged above thirty years ago, that the genera are the substantial divisions in botany ; that the asserted difference between the species and local varieties of botanists has no firm basis ; and that it is a matter deserving grave consideration, whether even a multitude of established genera are not variations from fewer original kinds, of which the real limitation may be found in a higher position amongst tribes, classes, or orders ? And, if that point be established, as I humbly think it must be in the vegetable kingdom, upon what footing will the species and varieties of zoologists stand, when the analogies between plants and animals are fully considered, which it is not my province, and which I do not pretend to have sufficient depth of knowledge, to investigate ?

The Orchidaceous plants exhibit the most confusive diversities. When it is made a question whether Maxillaria Warreana and costata should not be removed into the genus Peristeria, and whether Bifrenaria and Dieripta should not merge in Maxillaria, we seem to stand on very loose footing as to those genera, though the doubt may be perfectly consistent with the most skilful botanic discernment. And how should there not be such doubts, when we find the genus Catasetum produce at times, on the same stalk with its usual flowers, others that seemed, according to analogy, to belong to a different genus? Cycnoches Egertonianus produces at random forms of inflorescence almost as different, both in form and color, from each other as those of any two genera in the order. Can we, in face of those phenomena, assert that no vegetable since the period before the sun and moon gave it light, no bird or fish since the Almighty called them forth from the salt mud, no creature of the earth since it was evoked from the dust, can have departed from its precise original structure and appearance? Let us be more humble in our assumptions of scientific knowledge, less bigoted and self-sufficient in our examination of revealed truth, and let us give glory to the infinite and unfathomable power and wisdom of God. I call it self-sufficient to hold that ancient and obscure words can have no possible meaning, but that which we have been in the habit of attributing to them inconsiderately. It may be unacceptable to the botanist, who has been accustomed to labor in his closet over dry specimens, and thinks he can lay down precise rules for the separation of genera, and looks with complacency upon the scheme he has worked out, to find that the humblest gardener may be able to refute him, and force him to reconsider the arrangement he has made; but the fact is so. The cultivator has the test of truth within his scope,—

Examenque improbum in istâ
Castigat trutinâ;

and, far from being an evil, I look upon it as a great advantage, because it will lead the industrious and intelligent gardener to take a higher view of the objects under his care, and to feel his own connection with science, and it will force the scientific to rely less on their own dictation, and to feel that they must be governed by natural facts, and not by their own preference. Croſs-breeding amongst Orchidaceous plants would perhaps lead to very startling results; but unfortunately they are not easily raised by seed. I have, however, raised Bletia, Cattleya, Orchis (Herminium) monorchis, and Ophrys aranifera from seed; and if I were not during the greater part of the year absent from the place where my plants are deposited, I think I could succeed in obtaining crosses in that order. I had well-formed pods last spring of Orchis by pollen of Ophrys, as well as other species of Orchis, which had been forced; and if I had remained on the spot I think I should have obtained some cross-bred Orchidaceous seed. An intelligent gardener may do much for science by attempts of this kind, if he keeps accurate notes of what he attempts, and does not jump at immature conclusions.

It was not surprising that the late Mr. Haworth should have told me many years ago that *he* did not thank me for my mules; not that I had sent him any, but because he probably began to have an indistinct misgiving that they were striking at the very root of the minute divisions which it had been the favorite labor of his life to establish, as definite and absolute. With accurate discrimination of individual specimens, and great industry in searching them out, his mind had not capacity even to combine the seminal variations of particular species, and he found the high-road on which he was travelling broken up by a troop of unexpected invaders. I mentioned long ago that I had raised at Mitcham primrose, cowslip, oxlip, and dark polyanthus, from the seed of one plant highly manured without any hybridization.

Concerning Petunia, and the genera allied to it, I have nothing to add to the observations in my treatise on hybrid intermixtures, Amaryl. p. 377—9, to which I beg to refer the reader. I have no reason to alter any of the views expressed in those pages, but I do not recollect that I pushed the experiments relating to them any further.

In a treatise on this subject I must not forget Plant's vegetable monster, of which I gave the particulars, with an engraving, at the commencement of the miscellaneous matter in the 'Botanical Register' of 1843. The sketches were made by myself with the most careful accuracy, from the three plants which were sent to me by Mr. Plant, in a dormant state, from which they never awoke. They were, in fact, seemingly past hope, or nearly so, when I received them, and began to turn mouldy as soon as they were watered. I believe he lost at the same time the fourth, which he kept for himself. Whoever will examine the engraving, and read the particulars detailed there, can form as just an opinion as I can, whether he really had obtained four anomalous monsters from Gladiolus blandus, impregnated by an Hippeastrum, or whether they were something else which he had confounded with his supposed mule seedlings. They were like no vegetable known to me, and their strange form has certainly the appearance of fluctuation between the structure of a dry-coated annual corm, and a fleshy tunicated bulb. Even Mr. Plant thought they would prove incapable of flowering. Their leaves, which I did not see, were stated to have been more glossy than those of a Gladiolus; and they scarcely appear to have been capable of a protracted existence, unless under the most unremitting care. He stated that they had suffered from neglect while he was ill. I am inclined to believe that they were biordinate and semiabortive mules; for I cannot absolutely repudiate the possibility of monstrous impregnations, though I believe the produce to be doomed to a very brief existence, if ever brought to life.

P. S.—It appears from a communication lately received that I have not made myself clearly understood in the first article respecting the diversified features that have become fixed characters in the human and other races. I consider that causes of change must have been in active operation in the first period after the deluge, which subsided, and no longer produce such powerful effects ; and that it is probable (whatever those causes may have been) that they were still more cogent in the periods which preceded the creation of man ; producing alterations of a much stronger character than any which have since arisen. If I am asked what those causes were, I cannot pretend to answer. But I think the cooling of the body of the earth, with consequent variations in the gases that emanated from, and were absorbed in, and surrounded it, a very likely cause of variations in the things that sprung therefrom. I imagine that at this moment the relative temperature and moisture of the fibrous roots and of the bulb or point of union between the root and shoot in vegetables, and between the feet and the head in men and animals, is of infinitely greater importance than either cultivators or medical practitioners have suspected. I am told that some persons who devoutly hold that mankind sprang as we are told, by generation, from one created pair, nevertheless think that the peculiar aspect of the various races of men was a judgment afterwards miraculously stamped upon them by God, as their speech also was diversified to separate them at the dispersion ; but, if that be admitted to the exclusion of natural causes, we must hold like judgments to have been inflicted upon dogs, of which the distinct races are quite as various, and their origin as much enveloped in obscurity. Neither do such persons consider rightly what a miracle is. It is a thing arising contrary to the usual and apparent course of events, and shown either by prediction, or by the circumstances of the event, to have arisen for a peculiar object ; but it may have been produced by the unexampled or even unusual operation of natural causes, which we cannot easily fathom, working together by the Almighty will to produce the marvel. The appearance of three suns in the heaven by an extraordinary effect of refraction is a well-authenticated fact, and it was a great marvel, but not a miracle ; that of the sun, continued after its hour of setting, whether caused by refraction or by some disturbing power that deranged the usual course of the earth's movements, was not merely a marvel, but a great miracle, because it happened at the prayer of Joshua, for the purpose of giving him light to overthrow those who were striving against God's people. The driving back of the Red Sea by a wind of unparalleled strength and continuance acting upon an unusual ebb-tide so as to lay bare a transverse sand-bank was in itself a great marvel, but occurring at the precise moment and place of the arrival of the Israelites so as to let them pass, and ceasing exactly at the fit moment to destroy all their pursuers, was a stupendous miracle. The plague of locusts fell last year on Zante, and the murrain both of beasts and potatoes has fallen on our own land ; but in Egypt they were miraculous, because specially invoked by God's prophet. The demonstration of the natural means through which the Almighty worked a miracle, which could have been performed by no slight of hand, but by the power of Him alone, increases (instead of diminishing) the force of the miracle, by strengthening its credibility, and distinguishing it from the pretences of impostors ; and its force is infinitely greater when those natural means, unsuspected by the persons who witnessed and reported it, are brought to light by the progress of science in confirmation of the fact. I assert, therefore, without hesitation, that, if the diversification of the human races was intended with a view to effect their dispersion, such a miracle would, in all probability, have been effected by the operation of natural causes, and that the like diversification of other races proves that it was so effected.—*Journal of the Horticultural Society of London*, Vol. ii, part 2.

HOW TO PRESERVE THE VITALITY OF SEEDS.

Now that those who have friends in distant countries (and how few have not ?) are preparing to send them supplies of seeds, it may be as well to draw attention to the circumstances which mainly influence the preservation of seminal vitality ; for thus alone can be avoided the serious losses and the much more vexatious disappointments which attend the unsuccessful conveyance of seeds in long voyages. The whole philosophy of this matter, however, as far as it is understood, would occupy more space than we can spare, and therefore we can only touch upon the main points.

The preservation of vitality in seeds depends upon preserving the stability of the chemical compounds of which they consist. This we believe to be the hinge upon which everything turns. Before a seed is quite ripe its elements are highly unstable or liable to change, and the least alteration in the conditions to which they may be exposed will cause it either to germinate or perish. But when a seed is perfectly ripe its elements become comparatively stable or indisposed to change, and to induce germination is in proportion difficult, while those alterations which are succeeded by death are slow in taking effect.

Dryness in all cases, and in some a perfect exclusion of atmospheric air, are found to be the conditions upon which the preservation of life in seeds mainly depends. Some seeds will live for a long time if gathered ripe and preserved quite dry ; others will perish after a short time although kept dry, and these demand the exclusion of air in addition. Corn, pulse, and in general farinaceous seeds, belong to the former, while all oily seeds, and such as contain much tannin, are to be classed in the latter series ; apparently because of the great affinity of their compounds for oxygen. This explains why, under the same circumstances, one kind of seed will survive a voyage, and another dies. A man buys corn, peas, beans, mast, acorns, and holly-berries, and sends them to the antipodes : the first three and the last survive the voyage : the others invariably perish.

The mode of packing seeds is generally such as to render this risk greater than it need be. Half dried seeds are placed in half dry papers, and the whole are enclosed in a tin case placed in the hold of a ship. There the temperature rises; the dampness present favors germination; growth commences; all the stable chemical compounds of the seeds are suddenly converted into unstable principles, and as growth cannot possibly go on death ensues; then follows decay.

The remedy for this is obvious enough. Great care in drying the seeds, and the papers they are packed in, and free ventilation in a cool place, such as a coarse bag suspended to a nail in a cabin, counteract the dangers to which farinaceous and similar seeds are usually exposed. But with the second class such precautions are ineffectual. For oily seeds, beech-mast, acorns, nuts, and grain of a similar nature, the exclusion of air is indispensable. The mode of securing this object is usually to enclose seeds in dry earth or sand *rammed hard;* or in charcoal powder, the whole covered with tin or put in a stout box; and no better common method seems to exist. It is, however, far from perfect, and therefore much disappointment occasionally attends its use.

It is worth inquiring whether all seeds would not preserve their vitality most perfectly if kept in an atmosphere of carbonic acid, which would seem likely to oppose an effectual barrier to those changes which destroy seminal life. Now that the glass-workers can do as they please, it would be easy to have bottles so contrived that after being filled with seeds their air might be exhausted and replaced by carbonic acid, which might be retained by hermetically sealing the aperture in the bottle. We trust that the experiment may have a trial, and that the result will be reported for the public benefit. If it fails the loss would be trifling; if it succeeds the gain would be enormous, for the cost of bottles and their proper preparation would bear no kind of proportion to the value of the seeds preserved.

It is not, however, enough to pack seeds securely: it is equally necessary that those who receive them should know how to treat them. We entertain no doubt that in many cases, for what are called "bad seeds" we ought to read "bad gardeners;" and that the want of skill on the part of those who receive seeds is at least equal to that of the senders. This is, however, a distinct question which we must reserve for a future occasion. In the meanwhile, in order to illustrate the circumstances under which the vitality of seeds is preserved accidentally for a long series of years, we cannot do better than give the substance of a statement published a year or two ago by Mr. Kemp, in the "Annals of Natural History" (vol xiii. p. 89). This is one of the few instances in which the suspension of vitality in seeds for a very long period is unquestionable. This gentleman says that, having received some seeds which were found at the bottom of a sand-pit upwards of 25 feet in depth, he most carefully examined into all the circumstances of their discovery. They were first seen by a respectable workman who was excavating the finer sand at the bottom of the pit, in a part which was rather undermined; and fortunately Mr. Bell, of Melrose, the proprietor of the place, was looking on at the instant that they were disinterred. He kindly sent some of the seeds to Mr. Kemp, who immediately, in company with Mr. Bell, carefully examined the layer in which they had been imbedded. The seeds were apparently of only two kinds; specimens of them were sent to Professor Lindley, and the others sowed by himself. The plants reared by Mr. Kemp were ascertained by Professor Henslow to consist of Polygonum convolvulus, and a variety of Atriplex patula; the seeds planted at the Horticultural Society produced Rumex acetosella and an Atriplex. The latter was, according to Mr. Babington, exactly like a variety of A. angustifolia; but we regarded it as a form of A. patula.

The sand quarry in question is described as being situated about a quarter of a mile west of Melrose, and at the height of between 50 and 60 feet above the nearest part of the Tweed. The seeds were mingled with some decayed vegetable fibres, and formed a layer resting upon another layer, 8 inches in thickness, of fine sandy clay. This latter lay over a mass of gravel, which again rested on a great mound belonging to the boulder formation. This mound, which extends about a mile along the middle of the valley, is about 90 feet in thickness, and Mr. Kemp believes was formed by the action of glaciers. It contains enormous angular blocks of rock, and others smoothed and distinctly scored in lines parallel to their longer axes. The layer of sandy clay, on which the seeds rested, was capped by upwards of 25 feet in thickness of distinctly stratified sand, which has been largely quarried. The beds of sand vary in thickness and in fineness; sometimes they alternate with thin seams of impalpable clay, and sometimes they contain minute pebbles and fragments of carbonaceous decayed wood. The layers slope at an angle of 15 degrees towards the valley, and in this direction they thin out; the upper layers extend further into the valley than the lower ones; the entire mass has a level top, and is capped by some thin beds of fine gravel. From these several facts, observes Mr. Kemp, and from the general aspect of the layers of sand, it is scarcely possible to doubt that the seeds were deposited by a river or torrent, at the point where it entered a sheet of water. "I had long been of opinion," he adds, "that the valley of the Tweed in this part must formerly have been occupied by a lake, at a period when a great trap-dyke, 100 yards wide, which crosses the valley four miles lower down at Old Melrose, had not been worn through. By an accurate levelling I have ascertained that the layers of sand lie just beneath that level which a lake would hold if the barrier at Old Melrose were reclosed. A depression on the surface of the land can also be distinctly followed from the spot where the sand-quarry is situated, up the valley, to where it joins the bed of the existing river. I cannot doubt that the Tweed anciently flowed in this depression, and deposited on the borders of the lake the layers of sand where we now find them. It is certain that in the time of the Romans, about 2000 years since, no lake existed here; and when we reflect on the time necessary to have worn down the barrier of trap-rock and to have drained so large a lake, which must have stood at its highest level whilst the thin layers of sand were deposited over the bed with the vegetable remains, the antiquity of these seeds is truly astonishing, and it is most wonderful that they should have retained their power of germination."

To us it appears that the circumstances which enabled them to do so were their original nature, they having belonged to what may be called the farinaceous series, and secondly the exclusion of air by the beds of sand that gradually formed over them.—*(From the Gardener's Chronicle, October,* 1847.*)*

ON THE PRODUCTION OF VANILLA IN EUROPE.

In marshy bushy places on this journey, I saw many plants of the *Vanilla planifolia*, seldom bearing flowers, and more rarely producing fruit. It has now been satisfactorily determined, that this is the species from which the true Vanilla of commerce is procured. In Mexico it is extensively cultivated for the sake of its fruit, which it yields abundantly : while the plants which have been introduced into the East Indies, and the hothouses of Europe, though they have frequently produced flowers, have very seldom perfected their fruit. Dr. Morren of Liége was the first to study attentively the natural history of this plant, and to prove experimentally that the fruit of the Vanilla may be as freely produced in our hothouses as it is in Mexico. He has discovered that from some peculiarities in the re-productive organs of this plant, artificial fecundation is required. In the year 1836, a plant in one of the hothouses in the Botanic Garden at Liége produced fifty-four flowers, which having been artificially fecundated, exhibited the same number of pods, quite equal to those imported from Mexico ; and, in 1837, a fresh crop of about a hundred pods was obtained upon another plant by the same method. He attributes the fecundation of the plant in Mexico to the action of some insect which frequents the flower ; and hence accounts for the non-production of fruit in those plants which have been removed to other countries. There can be no doubt that this plant is as perfectly indigenous to Brazil as it is to Mexico ; but it is no less certain that its fruit is there seldom matured. Is this also to be attributed to the absence of the means by which nature is supposed to effect fecundation in Mexico ? This is a subject which, as Professor Morren justly observes, well deserves attention in a commercial point of view, since his experiments go to prove that in all intertropical countries Vanilla might be cultivated, and a great abundance of fruit obtained.*—*(Travels in the Interior of Brazil. By George Gardner, p.* 296.*)*

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* See Professor Morren's paper "On the Production of Vanilla in Europe," in Taylor's Annals of Natural History, Vol. iii. page 1.